WORLD OIL

SPECIALIZED FOR EXPLORATION, DRILLING, PRODUCING, PIPE LINE OPERATIONS AND MANAGEMENT

JANUARY, 1953

What's Ahead In '53?

•

Current Outlook Section

UNIV. OF MICHIGAN
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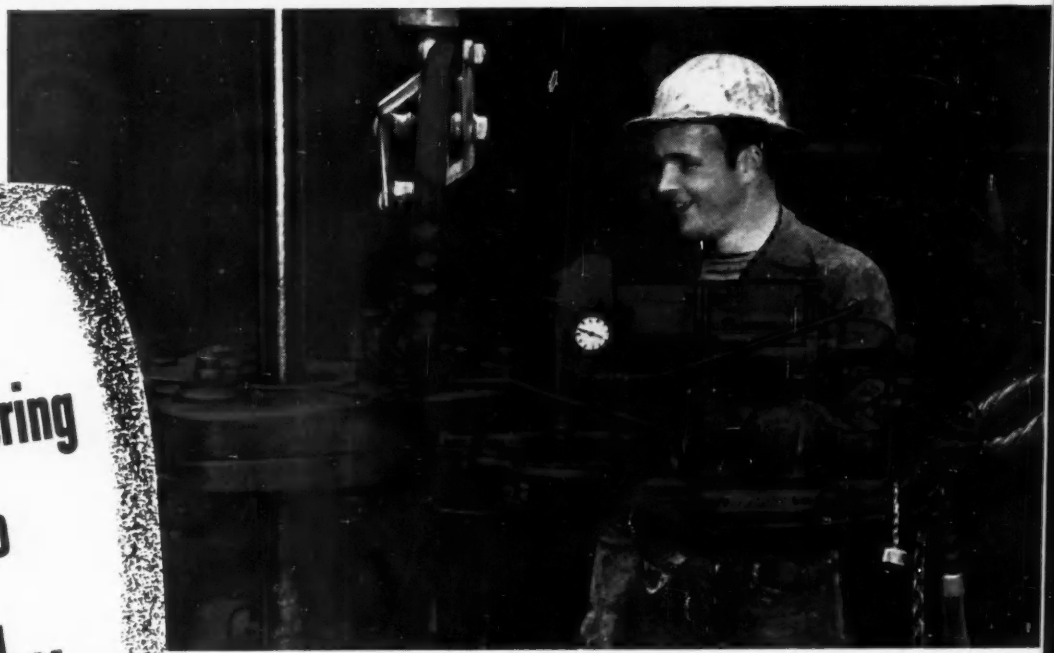
EAST ENGINEERING



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January, 1953 **Volume 136, No. 1**

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Single copies 50 cents (except special issues). Subscription price: domestic and foreign, $2 a year; 2 years, $3; 3 years, $4. WORLD OIL, published every month except semi-monthly in February and August. Entered as *The Oil Weekly* as second class mail matter December 23, 1916, at the post office at Houston, Texas, under the act of March 3, 1879. Advertising rates on application.

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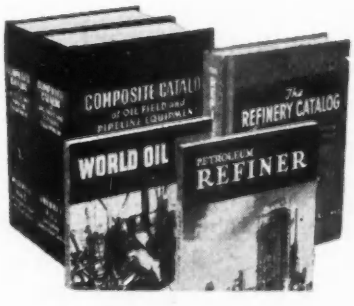
Indexed by Industrial Arts Index and Engineering Index



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CURRENT OUTLOOK SECTION

Looking Ahead		39
Editor's Page	Warren L. Baker	41
The Changing Panorama		43
Report From the Observatory	Ray L. Dudley and Warren Baker	44
Petroleum Trends in the U. S.	Cecil W. Smith	46
News Analysis		48
The Month's Completions		54
What's Ahead in '53		59
You Can Save Money on Taxes	H. O. Reyburn	64
How to Present Property Appraisal Data	R. I. Bradley	68

NEW EQUIPMENT SECTION

For More Information on Products Advertised	74
Reader Service Postcards	75
New and Improved Equipment	77
Other New and Improved Equipment	79
New Literature	82
New Catalogs and Equipment Literature in Advertisements	84

EXPLORATION SECTION

Improved Magnetic Method Can Avoid Drilling Failures	Mark Milstein	88
Odd Geologic Structures of Southern Oklahoma (Part 2)	Dr. C. W. Tomlinson	90
Some Facts About Fossils		96
Exploratory Drilling Still High		100
U. S. Discoveries in November		102

DRILLING SECTION

How to Train Mud Engineers (Part 1)	Fred Chisholm and B. Q. Green	115
Simultaneous Log of Radioactivity Curves Cuts Standby Time	Gilbert Swift and C. C. Roberts	122
WORLD OIL Graphics: 'Green' Bit Care		130
Shop-Made Rig Speeds Operations	A. R. Frank	131
Closed Steam System Cuts Boiler Maintenance and Fuel Needs	George L. Daggs	132
How to Select and Install Braking Equipment	Allan Fredhold	135
Be Safe Though Small	Gordon Oliver	140
Drilling Hints		146

PRODUCTION SECTION

New Multiple Fracturing Process	George Howard and William G. Bearden	159
28,000 Barrels of Brine Disposed Daily in Six Wells	J. F. Armstrong	164
Hole Diameter Influences Neutron Derived Porosity	C. B. Scotty and E. F. Egan	172
Shop-Made Pump Aids Operators		179
New Method Estimates Gas Well Performance	Dr. David Cornell	180
Inverted-Type Packer Solves Salt Water Injection Problem	George S. Flanders	186
How to Pump Deep Dual Completions Alternately	J. R. Hatfield	188
Portable Pipe Vise Speeds Threading and Cutting		190
Production Hints		193

PIPE LINE SECTION

El Paso Natural Completes a Circle of Communication	B. Marshall Willis	203
New Code for Gas System Piping on Way	Donald M. Taylor	210
Perils of Pipe Line Pete		214
Shell Pipe Lines Crisscross Seven States		216
Pipe Line Portrait: H. H. Anderson	Al Reese	218
Pipe Line Personals		219
Pipe Line Construction	Marion Dennard	221
Pipe Line Hints		230

INTERNATIONAL SECTION

Global Oil and Trouble Grow Together (Part 1)	Dr. Cornelius H. Zondag	237
Operation Alaska	Capt. R. H. Meade	239
Austrian Oil a Victim of Tensions	G. G. Rosu	242
Of World Oil Men		246
A WORLD of OIL	Don Kliewer	250

DEPARTMENTS

Readers Guide	2	News of Service and Suppliers	265
Advertiser's Index	6	Trading Post (Classified Advertising)	270
Who's Meeting Where	36	New Books, Maps and Movies	271
News of Men in the Industry	259	Squeaks From the Bullwheel	272
Companies in the News	263		
Association News	264		

A Quick Guide to

WORLD OIL this month . . . .

Current Outlook

A more favorable government attitude and understanding of business and the free enterprise system is among the prime reasons for a more cheerful outlook in 1953, says Editor Warren L. Baker. The oil business along with other businesses will benefit from improved conditions resulting from expected lower taxes and free market prices. Petroleum demand may not increase as much as in recent years, but indications are that "good things are ahead." *Editor's Page.* **Page 41.**

✓

You can save money on taxes. Are you programming a drilling operation or thinking about abandoning a lease? Well don't forget about the income tax collector. If oil operations ar planned to fit tax regulations, there'll be big savings. But if planning is lax, there'll be a bigger tax. **See Page 64.**

✓

Are you applying for a loan or selling property? If oil or gas producing holdings are involved, here's some information that will save you money, time and trouble. It's a discussion and basic outline of data usually required by lending institutions or appraisal engineers in evaluating oil or gas properties to be offered as security. A handy guide to independent operators or companies contemplating loans or sale or exchange of property. **Page 68.**

. . . what's ahead in '53?

Petroleum prices should be decontrolled in 1953 to assure vigorous development and expansion. This is the belief of executives who participated in WORLD OIL's third annual symposium on major problems likely to be encountered by the industry during the new year. It is argued that the industry has been expected to provide substantial excess crude productive capacity to meet the demands of defense, but has not been encouraged through fair prices to expand its facilities. The executives also expressed great concern over the steel supply, a proper balance between supply and demand, and the problem of righting the wrongs inflicted by the outgoing administration. **Page 59.**

Exploration

Promising targets indicated, drilling failures prevented! That's the prospect of the magnetic method if properly applied. Good results and substantial savings are promised by this economical tool of exploration. Mark Milstein, 30 years active in geophysical work and an authority on magnetic technique, says numerous wildcatting failures in Sutton County of West Texas in recent years have borne out predictions made as early as 1948 on the basis of improved magnetic methods. **Page 88.**

✓

Plain derrick floor language describes one of the most important helps in finding oil in the article *Some Facts About Fossils* starting on **Page 96.** Rewritten in nontechnical language by WORLD OIL's Anthony Gibbon, this article on paleontology answers a lot of questions field and office men have asked. People in the front office as well as on the derrick will find it interesting and informative.

✓

Wildcatters slowed operations slightly during November after reaching new heights a month before, but still the year's search for new oil and gas sources outranks any in history. A comparison with the 1951 peak is given on **Page 100.**

Drilling

Training for a multi-million-dollar responsibility. With the development of highly specialized muds, proper drilling mud control is essential to protect the well bore and formations opened by the bore hole. The mud engineer is a mighty important man. Costs can be cut through increased education on drilling fluids. Beginning on **Page 115** is an outline of the training program offered by one company. It will assist operators in designing a simple, workable plan. It's the first of a two-part article.

✓

A new radioactivity well logging technique permitting simultaneous recording of gamma-ray and neutron curves has been developed. It cuts rig downtime in half. Operators can reap big savings. Crews can serve more wells in a given pariod of time. For more about this new development, see **Page 122.**

Use this condensed information on this month's principal articles. Run through these digests rapidly. ✓ Check those you want to read first.

Shop-made rig speeds operations. Made from automobile parts, conventional rotary and cable tool equipment, this inexpensive rig offers complete unitization, permitting rapid rig-up and tear-down. **Page 131.**

✓

A closed steam system on drilling rigs will reduce boiler maintenance and fuel requirements. And here's how one company has increased overall plant efficiency by nearly 20 percent, while water treating problems have been cut to a minimum. Water consumption was reduced 75 to 80 percent by condensing all exhaust from equipment on drilling barge and returning it to boiler barge for reuse. **Page 132.**

✓

Don't neglect your braking equipment. Modern rotary drilling brakes are called upon to hold excessive loads when running drill pipe or casing. The drawworks is no better than the braking mechanism. The proper selection and installation is important. Here's an explanation of the principle of drawworks brakes and the procedure to follow in revamping old brakes or selection of a new system. **Page 135.**

✓

No company is too small to have a safety program. Safety is not limited to a chosen few. And Safety Consultant Gordon Oliver points out that a safety program can be more easily carried out by a small contractor than a large one. The reason? Management is much closer to the employes. *Be Safe Though Small.* **Page 140.**

Production

Further improvements to increase the formation fractures in Stanolind Oil and Gas Company's new method are described in the article beginning on **Page 159.** An ingenious technique to stop up old fractures, so new ones can be made, thereby increasing drainage from the producing formations is dealt with by coauthors George Howard and William G. Bearden. A brand new development on an idea that, in itself, is new.

Disposing of 28,000 barrels of salt water economically and efficiently every day was the problem which faced The Carter Oil Company in the Loudon field of Illinois. Carter Engineer J. F. Armstrong tells how the problem was met. A logical approach to designing and constructing a system to service 250 wells. Types of pipe used in 75-mile system and how it was laid. **Page 164.**

✓

Here's an answer to an often-asked question—How accurate are porosity estimates based on the log deflection of neutron-gamma rays? A careful investigation was made on wells in the Canyon Reef fields of West Texas. The result—this new empirical method for predicting relationship between porosity and log deflections. For some significant results, read *Hole Diameter Influences Neutron Derived Porosity.* **Page 172.**

✓

How to bail sand without blitzing your budget. Do you have an occasional sand problem? A problem that must be solved without excessive costs. Here's a simple and effective way to get the job done. Complete details on construction and operation of a sand pump made from salvaged parts. **Page 179.**

✓

Estimate gas well performance faster with this new method. Don't waste time and money on extensive tests to determine production under certain conditions. Short back-pressure tests can be made and the so-called "draw-down" curve extrapolated to give you the answer. Dr. David Cornell of the Texas Petroleum Research Committee outlines this new technique, its theory and gives sample calculations. **Page 180.**

✓

Having trouble with salt water injection problems? Many of the answers can be supplied by use of inverted or upside-down type packers. Here's some practical information on handling high-pressure injection wells and a discussion on corrosion and running a packer in mixed weights of casing. **Page 186.**

✓

Here's how to pump deep dual completions alternately. Cities Service has been using a pump changeover device in West Texas and Kansas to pump each

of two zones alternately so that both producing horizons make their allowables each month. The method manipulating tubing on deep wells to pump from either zone. **Page 188.**

✓

Cutting and threading pipe was made easier when an alert roustabout crew decided to do something about it. The result is a simple gadget that saves manpower and speeds up the job. Details of this portable, power-driven pipe threader and cutter are on **Page 190.**

Pipe Line

The nearest thing to a foolproof communications system is El Paso Natural Gas Company's "circle of communication"—4600 miles of telephone lines, 19 radio stations and a 450-mile microwave link. From El Paso, any point on the system can be reached two ways—the northern or southern leg of the circle. The story—with pictures—starts on **Page 203.**

✓

The most important development in the gas industry today. That's how the work of a subcommittee of the American Standards Association has been described. This committee is working to revise the gas piping code and get it approved by the various gas companies, ASA and other organizations by next July. The new code will standardize construction and design practices in the industry and forestall moves by various state governments to adopt individual codes. For progress report to date, see **Page 210.**

✓

Pete mowed 'em down at a party, and everybody laughed. But there was nobody even smiling when he tried the same technique behind the wheel of a bulldozer. Pipe Line Pete continues to find out safety precautions—the hard way—on **Page 214.**

✓

Shell Pipe Line Corporation is spotlighted in the Map of the Month. In four decades the Shell system has boomed from a single 16-mile, four-inch line to a network stretching across 5800 miles in seven states. The story and map are on **Pages 216-217.**

✓

Hal Anderson is off on a new career, and his friends are betting that it will be as brilliant as the one he just closed with Shell Pipe Line Corporation. Big, forceful Hal Anderson, one of the oil industry's most gifted titans, is the subject of this month's Pipe Line Portrait. **Page 218.**

Personal notes on pipeliners you know are included in Pipe Line Men in the News, a section devoted exclusively to stories about people in the petroleum transportation industry. See **Page 219.**

✓

Who's building which line for whom where? You'll find the answers to this and other questions about new pipe lines in the monthly review of pipe line construction which begins on **Page 221.**

✓

Want to save some money and trouble at the same time? There's an easier way to do most anything, whether it's setting up a $2000 engine or a $5 floodlamp—and WORLD OIL tells you how to do it in the Pipe Line Hints, starting on **Page 230.**

International

Is oil a monopolistic, evil-intentioned villain? A new approach to the necessarily "big business" of producing the world's oil, discussed by Dr. Cornelius H. Zondag in his authoritative article commencing on **Page 237,** strips from the industry any cloak of imperialism. And he points out some routes by which oil companies themselves might help disengage their interests from the frothy mixture of billion-dollar headaches.

✓

What are Navy plans for continued exploration in Alaska? How is it going about the job? Captain R. H. Meade, Director, Naval Petroleum Reserves, answers these questions and discusses many other interesting phases of Arctic operations. **Page 239.**

✓

Western nations and Russia have locked horns on many diplomatic levels and over many nations. Austria and its oil are no exceptions. If you're interested in just how matters stand on the nation's oil industry, turn to **Page 242** for an expert's views.

✓

The squabble over North Sumatra concession rights may be nearing a decision. Difficulties are increasing for the Soviets in Hungary's Zala oil field. Swiss oil interests are eyeing the possibility of a new border-crossing pipe line. For additional details on these and other petroleum developments of interest throughout the world, please turn to International Editor Don Kliewer's column on **Page 250.**

Looking Ahead

There is increasing confidence that business will continue good in 1953. Fears of a recession are fading. Business men are ordering farther ahead. Prices of stocks have risen to the highest point in more than 20 years. Action is being taken on plans for plant expansion and development of new products. New construction will be heavy in 1953. Confidence has been generated by both election results and favorable economic developments.

Oil and gas industries likely will make greater capital expenditures in 1953 than ever before. Business in general, though heretofore expected to show decline of 10 to 15 percent in capital outlays, also, could equal or exceed record set in 1952, encouraged by political developments and prospects of lower taxes.

Technological advances ahead will greatly affect petroleum industry. Supplementing and competing with oil and gas will be atomic energy—to generate electricity for utility use and for powering ships and submarines. Electronic computing machines will aid reservoir engineering, helping to increase oil recovery. Also speeding up accounting and other work. Radio, television and electronic "brains" will provide automatic controls of many drilling and production operations. And permit push-button operation of pipe lines. Metallurgy advances will make possible new drilling feats. Chemicals from petroleum will increase.

Power to set aside steel, copper, aluminum, and other critical materials for military and atomic programs may be only thing kept alive in field of materials allocations when Defense Production Act expires June 30. Both government and industry favor modifying Controlled Materials Plan at start of 1953 to permit mills to sell and customers to use any steel not claimed by holders of allocation tickets. While government contemplates use of this modified system until June 30, steel industry proposes scrapping CMP March 31.

Controls of petroleum industry materials could be removed satisfactorily by end of first quarter of '53. This is opinion of executives of various associations in oil and related industries. In meeting with materials men of PAD in Washington December 8, industry spokesmen generally favored decontrol of tubular goods as soon as supply balances demand. It was stated that pipe supply apparently would be short if effort should be made to drill the same number of wells in 1953 as in 1952. Consequently, some oil men and drilling contractors doubt if industry will drill any more wells in 1953 than in 1952. They predict the total may be even lower unless some unforeseen development changes outlook.

Curbing of U. S. government's acquisition of land is urged by various business and civic groups. This would be favored by many oil men, who have found government less desirable to deal with than private owners. Federal government has greatly increased acreage in past 20 years. It now owns 24 percent of all land in U. S. It holds in excess of 455 million acres, not including Indian reservations nor the federal lands in Alaska and the other territories. Federal land ownership means loss of taxes for states where acreage is located. It also prevents profitable development of natural resources, such as timber, coal, oil, gas and other minerals by private, taxpaying owners.

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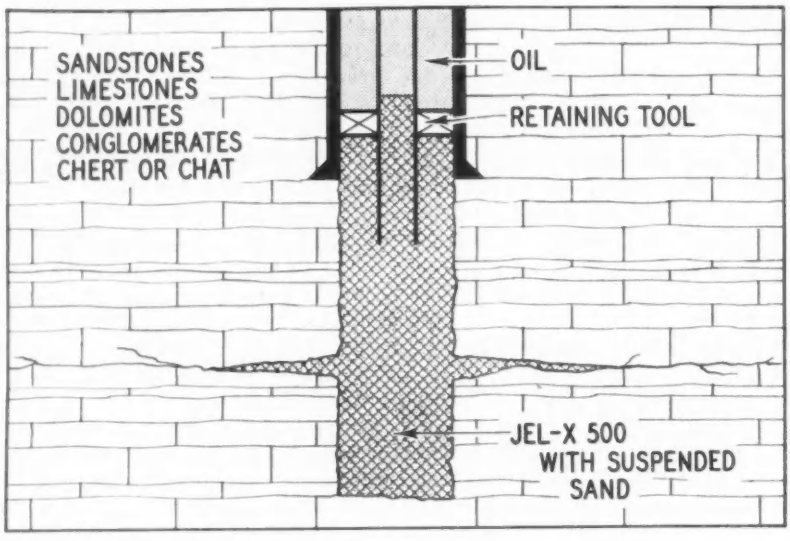

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Editor's Page

Good Things Ahead

PROSPECTS ARE that U. S. petroleum demand will not increase as much during 1953 as in recent years. Consumption may even taper off should military demands lessen materially. The new year also finds a large quantity of oil in storage, indicating supply will be ample. Greatly expanded refining capacity, both in the U. S. and abroad, must be absorbed without creating an oversupply of products. Consequently, the industry's record breaking investment of new capital may slow down somewhat.

It is important that these changes be recognized as a return to more normal rates of growth and expansion. They should not be viewed as any kind of recession, but as being the result of abnormal expansion in recent years succeeding in bringing supply and facilities into balance with requirements.

There is a great diversion of opinion with respect to the outlook for business as a whole. Business is expected to be good for the first half of the year, but many observers anticipate some reduction during the last half of the year, especially if military expenditures are trimmed by substantial amounts. Consequently, there is a trend toward a more cautious attitude than has existed in recent years. However, cuts in military preparedness are not likely to be too drastic regardless of what may happen in Korea. Both business and government are in a better position than in 1929 to handle a drop in business. No major recession looms.

Despite these conditions, the oil business can look forward to 1953 with confidence and high hopes. Good things seem likely to outweigh adverse factors. It could easily develop into a very significant year. A great many new influences are at work, some of which have been created by the coming change in federal administrations.

• • •

A MORE FAVORABLE government attitude and understanding of business and the free enterprise system is indicated, and is one of the prime reasons for a cheerful outlook. Less unfair treatment would be a constructive change. Confidence in the future would be given a shot-in-the-arm.

Hope is generated that government spending will be slashed, permitting highly beneficial reductions in both corporation and individual taxes. This action could serve as a powerful stimulant to the country's economic welfare.

Prospects are better for abandonment of rigid government price controls, which expire next April. One of the biggest uncertainties would be removed by this action.

• • •

THE OIL BUSINESS, along with all other businesses, would participate in the improved conditions resulting from lower taxes and free market prices.

On the basis of what is known about the new administration's probable policies at this time, it appears that the oil business has additional reasons for looking ahead to the new year with confidence.

Relaxation or abandonment of price controls might be especially beneficial to the oil industry. No increases in oil prices have been permitted since 1947, despite higher operating costs. Profits have been squeezed, thereby lessening the incentive for exploratory work.

Retention of the depletion allowance for mineral industries now appears safer than anytime in the past 15 years.

Presumably the new administration will enact legislation giving the states title to the tidelands. Clearing up of this question would permit companies to go ahead with their oil and gas exploration program on offshore holdings.

All in all, 1953 promises to be a very good year for the oil business, although expansion rates may not be as great.

Warren L. Baker

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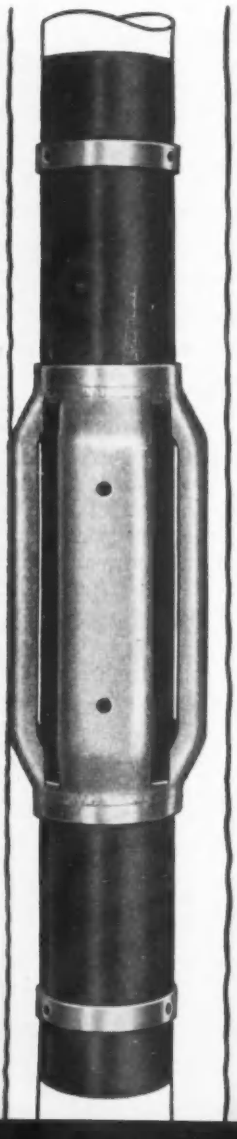

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The Changing Panorama

Demand for Government Bonds Is Due to Increase

LESS DIFFICULTY in selling government bonds to oil industry people as well as the public in general is promised as a consequence of the recent voting in of a new administration. Increased confidence in the financial responsibility of the government has been generated. It may be easier, therefore, for the government to sell its bonds to the people, instead of having to depend so heavily on forcing them upon banks, thereby "creating" new money out of thin air and debasing the dollar.

Now assured that earnest efforts will be made to cut government spending and to balance the budget, people can feel more confidence in the value of the dollar and in bonds or other obligations due to be paid off in fixed numbers of dollars.

The petroleum industry already is making a substantial contribution toward putting government bonds into the hands of individuals, through payroll savings plans for purchase of the bonds by employes. Most of the oil companies have continued regular payroll savings plans, and a special campaign was instituted last July 29, when the Secretary of the Treasury appeared before the National Petroleum Council and asked that the oil industry take the lead in stimulating sale of defense bonds through payroll savings plans.

The Council endorsed the plan and invited support of it by the industry. The response has been highly gratifying, according to S. A. Swensrud, president of Gulf Oil Corporation, Pittsburgh, chairman of the campaign. Not only the oil companies but also various trade associations and labor associations have pledged their support.

The U. S. Treasury strongly urges that purchases of bonds by individuals be kept up on a level providing a sound balance in the holding of our national debt between individuals and various institutions and our Federal Reserve and banking system.

Many people heretofore have had misgivings about urging employes to buy government bonds, Swensrud has conceded, because they lacked confidence in the way many of our government affairs were managed and because they hesitated to recommend a dollar type investment in the face of the constantly diminishing value of the dollar. But many of those who felt those misgivings may now feel more encouraged, he said, in view of the results of the recent general election. Many people now feel, he said, that barring an all out war, the value of the dollar may be better maintained over the years ahead than in the recent past.

Economists generally agree, said Swensrud, that it is far preferable for more of the government debt to be owned directly by individual citizens and other investors outside the commercial banking system, in order to minimize inflation and spiraling of prices.

In view of the improvement that is now promised in the management of government affairs, Swensrud said he considered it sound for the petroleum industry to support the government's payroll savings plan and to encourage employes to participate in it. He expressed the hope that efforts in behalf of the plans would be increased, so that the industry may make an outstanding contribution to this part of the national problem.

The Treasury Department would like to see a situation, he said, where 50 percent or more of the employes in each company, under one plan or another, were signed up to save systematically through the purchase of U. S. Defense Bonds.

Industry Helps Relieve Shortages

AS SUPPLIER of the raw material for many products, the petroleum industry is relieving shortages of various strategic materials and at the same time is developing important new markets. Oil and gas companies are helping to provide additional supplies of scarce sulfur and sulfuric acid, for example, by recovering sulfur from natural gas at gas processing plants.

Benzene is another scarce, strategic material that will become more plentiful because the petroleum industry has inaugurated production of it. As recently as 1949 the U. S. could produce only 156 million gallons of benzene a year. This was obtained from the steel industry as a by-product of converting coal into coke. Now the petroleum industry is planning or actually building plants capable of producing an equal amount, making possible a doubling of the nation's supply of this vital industrial chemical that has been in critically short supply.

Benzene is both a strategic material and an industrial workhorse. It plays a big role in the manufacture of hundreds of items, from plastics and medicines to dyes and detergents. Essentially a raw material, benzene goes into production of styrene, which with butadiene, also made from petroleum, is the heart of the synthetic rubber industry. It is also a raw material for phenol (carbolic acid), which in turn is used for making adhesives, dyestuffs, plastics and many other products.

In the early days of the automobile industry, benzene was used extensively as an ingredient of gasoline. As late as World War II it was a necessity in boosting the octane ratings of gasoline. Today it is replaced by less costly materials in both automobile and aviation fuels.

Following World War II, demand for benzene skyrocketed, the supply dwindled, and many industries were faced with using costlier raw materials. Then the petroleum industry worked out ways of increasing production of the vital chemical by cracking and reforming petroleum to produce stocks that are richer in benzene and other aromatics.

Report from the Observatory

Excessive Gasoline Stocks Likely

By **RAY L. DUDLEY,** Publisher, and **WARREN L. BAKER,** Editor

AN OVERSUPPLY of motor fuel before the end of winter is a definite possibility. Prospects indicating surplus quantities of motor fuel lie ahead are indicated by greatly enlarged refinery capacity, recent high refining levels, present large stocks and a slowing down of the rate of increase in demand. Unless refinery runs are reduced during the next three months, excessive inventories of gasoline seem certain.

• • •

ALREADY HIGH STOCKS of gasoline are growing at a faster rate than a year ago. Mid-December U. S. inventories stood at 130 million barrels, 4¼ million barrels above year ago volumes although they were only 1⅔ million barrels above the preceding year on November 1. Stocks this year have risen 9 million barrels since November 1 in contrast with a gain of but 6½ million barrels during the same period of time in 1951.

Inventories will grow more rapidly during January and February and seem sure to surpass the all-time high of 160⅔ million barrels reached the end of March, 1952. The question is how much more will be in tanks at the end of next March. This will depend upon the volume made by refiners as well as consumption levels.

Reduction of refinery crude runs during the first part of December from their 7 million barrel per day level of preceding months has been a move in the right direction. Continuation of lower refining operations is the key which will determine whether the industry is to be burdened with excessive gasoline next spring.

Even though runs to stills dropped below 6¾ million barrels daily during the week ended December 13, they were 250,000 barrels above the corresponding week of 1951 and resulted in output of gasoline being nearly 250,000 barrels per day greater than year ago output during the same week.

AGGRAVATING THE SITUATION is the great increase in refining capacity. The industry is confronted with the necessity of absorbing the output of sizeable new plant additions without creating an oversupply.

A new survey by PAD indicates the U. S. has sufficient facilities to run 7¾ million barrels of crude to refinery stills daily even after allowing time for normal shutdowns for cleaning and repair work. This represents an increase of 411,707 barrels over the refinery crude charging capacity of January 1, 1952.

Additional new facilities scheduled to be completed will boost refinery ability to run crude to 8,156,000 barrels by the end of 1953, indicating the industry will be capable of processing 8 million barrels of crude daily by mid-year. Daily average runs to stills in 1953 are not likely to exceed 7 million barrels. Consequently, capacity will be about one million barrels per day above needs.

This means the U. S. has plenty of refining capacity to meet all demands. Meanwhile, new refining capacity completed in Europe has made this area almost self sufficient as far as refinery requirements are concerned. Obviously, this will tend to reduce U. S. exports of refined products.

• • •

ADEQUATE DISTILLATE stocks are on hand. Hence, refiners will not find it necessary to maintain high refinery runs to provide an adequate supply of heating oil. This will permit plants to make reductions in refinery runs.

Mid-December stocks of distillate totaled 109⅔ million barrels, a decrease of nearly 11 million barrels since November 1. Due to high refinery output and warmer weather, this constituted a slightly slower rate of withdrawal than in the 12 million barrels taken from storage during the same weeks in 1951. Stocks of distillate in December were 12 million barrels greater than a year ago, whereas they had been only 11 million barrels greater than 1951 volumes on November 1.

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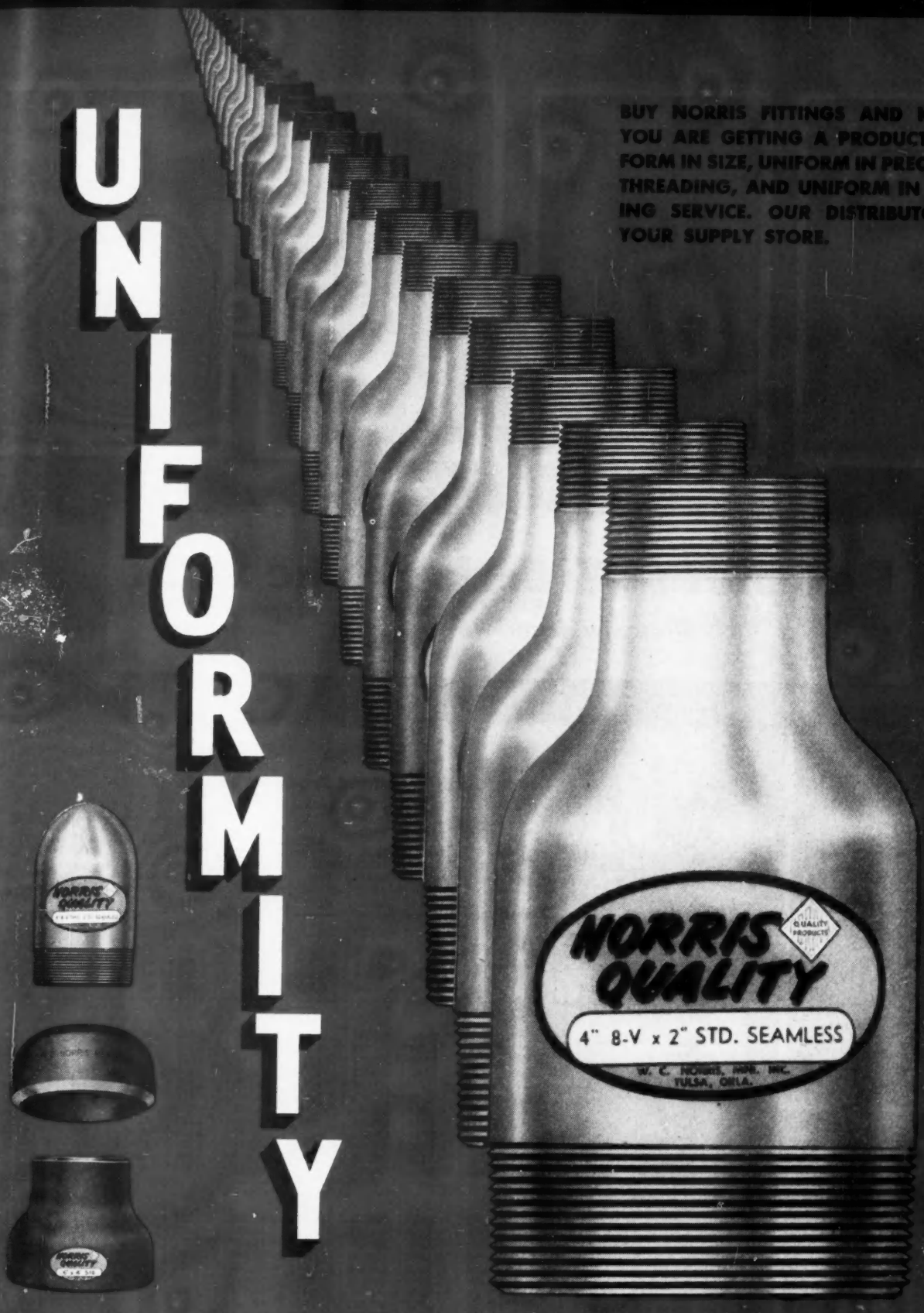

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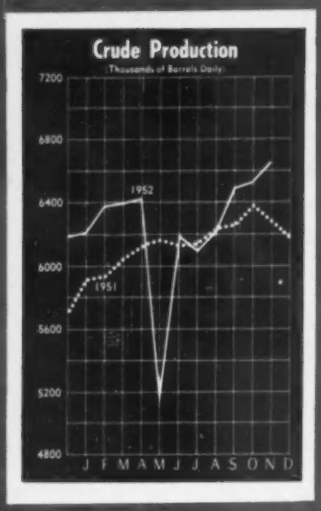
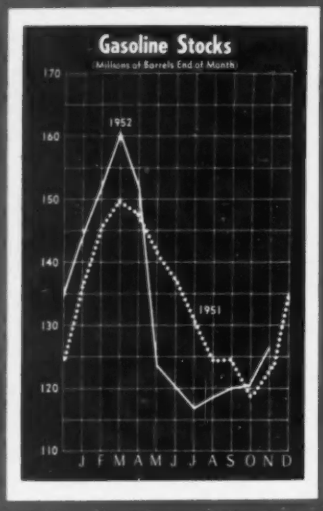
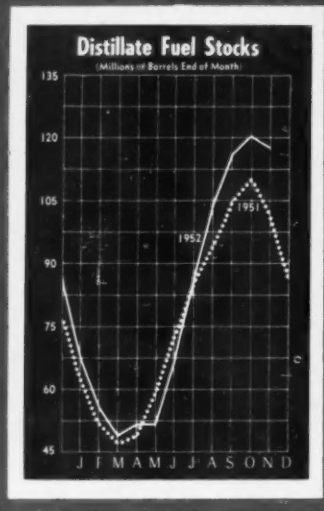
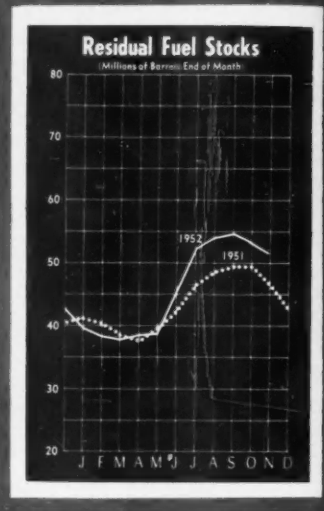


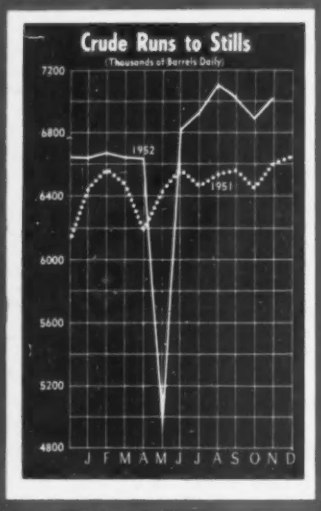


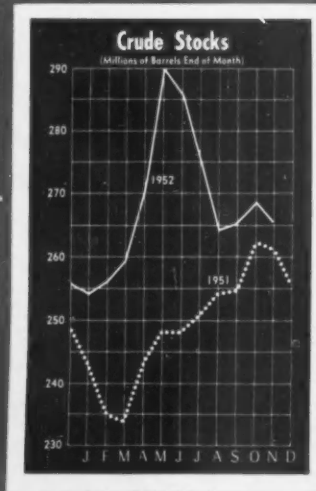




Petroleum Trends in the U. S.

By CECIL W. SMITH, WORLD OIL Staff

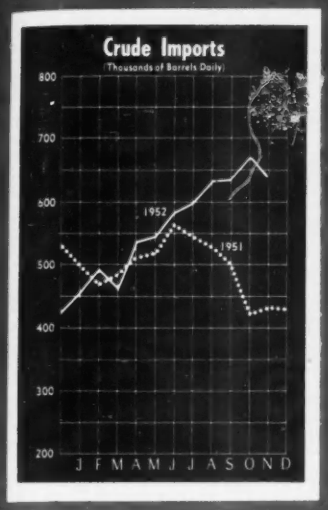


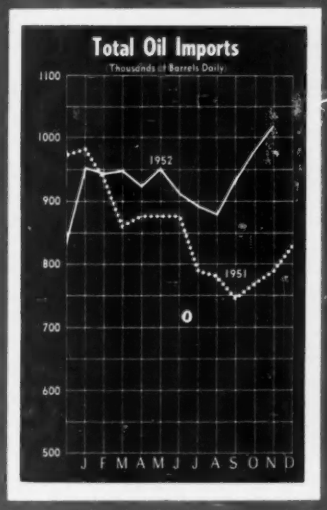


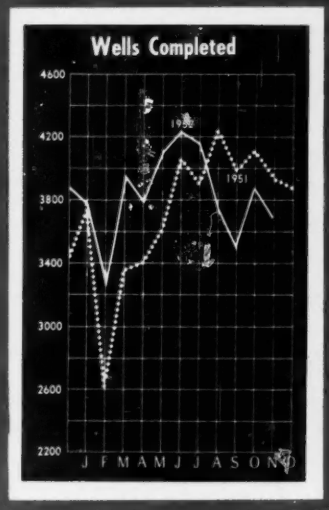
Crude Oil and Refined Products Trends

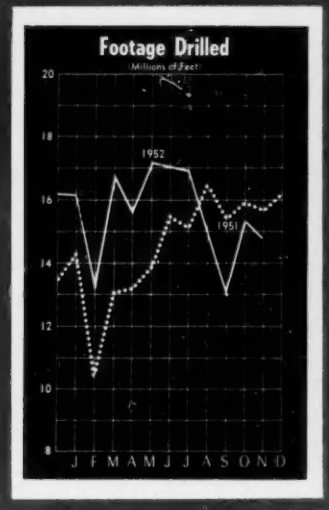
(THOUSANDS OF BARRELS)

MONTH	CRUDE OIL			GASOLINE		DISTILLATE FUEL		RESIDUAL FUEL		DAILY IMPORTS	
	Production Daily	Runs to Stills Daily	Stocks End of Month	Production Daily	Stocks End of Month	Production Daily	Stocks End of Month	Production Daily	Stocks End of Month	Crude Oil	Total Oils
1950:											
September	5,888	6,059	242,311	2,849	105,748	1,180	78,270	1,178	41,966	525	859
October	5,900	6,077	246,424	2,875	105,764	1,217	85,643	1,250	45,004	510	896
November	5,891	6,085	250,016	2,859	109,005	1,218	86,113	1,240	45,048	466	891
December	5,719	6,143	248,463	2,879	116,769	1,343	71,948	1,306	40,750	530	974
1951:											
January	5,907	6,450	243,107	2,962	136,145	1,427	62,163	1,368	41,251	499	977
February	5,930	6,562	235,247	2,906	145,184	1,419	51,348	1,382	40,716	468	937
March	6,052	6,469	233,824	2,908	149,679	1,327	46,744	1,348	38,366	483	861
April	6,127	6,183	243,180	2,821	147,679	1,171	48,239	1,230	37,623	511	871
May	6,170	6,436	248,418	3,031	141,658	1,210	59,272	1,265	39,879	518	876
June	6,130	6,575	248,170	3,100	137,009	1,254	72,140	1,277	42,398	563	876
July	6,141	6,462	250,847	3,091	130,931	1,228	84,282	1,275	46,320	546	788
August	6,232	6,539	254,276	3,114	124,202	1,237	94,028	1,226	48,365	529	780
September	6,261	6,558	254,900	3,127	124,530	1,282	104,082	1,228	49,603	500	744
October	6,375	6,446	262,266	3,105	118,864	1,295	109,544	1,224	49,573	421	769
November	6,272	6,609	261,100	3,130	122,723	1,358	101,666	1,304	46,491	425	802
December	6,182	6,646	255,783	3,150	134,867	1,442	86,619	1,313	42,853	423	834
1952:											
January	6,217	6,640	254,007	3,094	144,339	1,456	66,969	1,338	39,523	488	951
February	6,367	6,673	255,900	3,109	151,912	1,528	55,369	1,322	38,295	491	940
March	6,388	6,640	259,126	3,069	160,689	1,400	48,750	1,274	37,971	510	947
April	6,429	6,435	270,679	2,995	151,890	1,312	51,634	1,253	38,561	539	922
May	5,107	4,905	290,813	2,295	123,656	982	51,648	979	38,821	545	951
June	6,197	6,825	285,964	3,169	120,166	1,455	65,911	1,228	45,688	581	911
July	6,093	6,927	275,951	3,295	116,566	1,475	85,775	1,237	52,245	597	892
August	6,219	7,118	264,368	3,377	118,592	1,514	104,257	1,252	54,061	632	879
September	6,518	7,017	264,723	3,428	120,991	1,502	117,252	1,230	56,200	615	932
October	6,530	6,900	268,384	3,296	120,592	1,460	120,250	1,211	53,408	671	963
November	6,633	7,031	265,885	3,404	127,210	1,531	117,472	1,248	52,152	637	1,022
Nov., 1952 Change:											
In Month	+103	+131	−2,499	+108	+6,618	+71	−2,778	+37	−1,256	−34	+39
In Year	+361	+422	+4,785	+274	+4,487	+173	+15,806	−56	+5,661	+212	+220
Week Ended:											
12–6–52	6,477	6,809	268,053	3,360	129,470	1,459	114,362	1,255	50,658	477	1,049
12–8–51	6,221	6,610	259,085	3,197	124,063	1,445	100,603	1,285	47,290	405	751







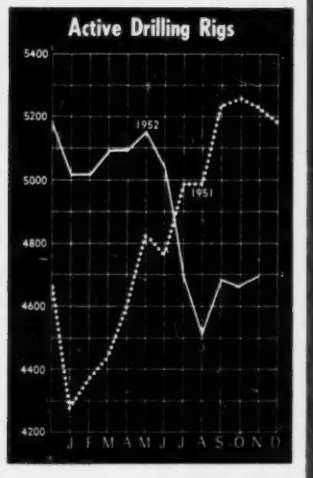


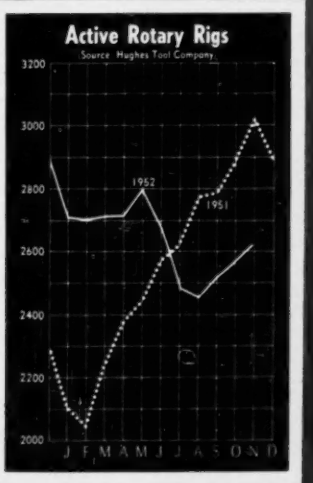
- **Crude production at new peak**
- **Refinery runs climb again**
- **Oil imports at all-time high**
- **Fuel oil stocks turn down**

U. S. Crude Production by States

(THOUSANDS OF BARRELS)

STATE or DISTRICT	DAILY AVERAGE PRODUCTION				TOTAL PRODUCTION First Eleven Months		
	November, 1952	October, 1952	November, 1951	% Diff. November, '51-'52	1952	1951	% Diff. '51-'52
Alabama	3.2	3.1	2.6	+ 23.1	863	933	— 7.5
Arkansas	76.4	75.6	80.4	— 5.0	26,679	27,264	— 2.2
California	984.4	978.8	982.8	+ 0.2	328,499	324,165	+ 1.3
Colorado	88.4	87.7	76.9	+ 15.0	26,885	24,861	+ 8.1
Florida	1.5	1.6	1.7	— 11.8	547	545	+ 0.4
Illinois	166.2	168.5	157.3	+ 5.7	53,738	53,544	+ 0.4
Indiana	33.7	33.9	31.1	+ 8.4	11,001	9,671	+ 13.8
Kansas	340.7	343.4	325.6	+ 4.6	105,031	105,490	— 0.4
Kentucky	31.2	31.2	35.3	— 11.6	11,126	10,576	+ 5.2
Louisiana	677.9	671.4	639.4	+ 6.0	219,469	212,048	+ 3.5
North Louisiana	112.4	111.7	117.0	— 3.9	38,668	39,438	— 2.0
South Louisiana	565.5	559.6	522.4	+ 8.3	180,801	172,610	+ 4.7
Michigan	37.1	37.3	36.6	+ 1.4	12,286	12,832	— 4.3
Mississippi	95.5	95.2	100.4	— 4.9	32,948	33,939	— 2.9
Missouri	0.1	0.1	0.1	.....	19	28	— 32.2
Montana	29.2	29.1	24.3	+ 20.2	8,623	8,208	+ 5.1
Nebraska	8.6	8.3	5.6	+ 53.6	2,131	2,237	— 4.7
New Mexico	171.2	170.0	156.4	+ 9.5	53,471	48,404	+ 10.5
New York	13.0	13.2	11.7	+ 11.1	4,027	3,912	+ 2.9
North Dakota	9.6	7.1	0.1	.....	1,218	19	.....
Ohio	9.0	9.1	8.1	+ 11.1	2,941	2,885	+ 1.9
Oklahoma	534.8	528.9	533.8	+ 0.2	175,376	171,516	+ 2.3
Pennsylvania	27.3	28.0	29.6	— 7.8	10,138	10,381	— 2.4
Tennessee	.....	0.1	.....	.....	8	13	— 38.5
Texas	3,088.8	3,002.0	2,837.5	+ 8.9	938,140	923,185	+ 1.6
Dist. 1—South Central	39.3	37.2	33.5	+ 17.3	11,337	11,152	+ 1.7
Dist. 2—Middle Gulf	179.2	173.6	170.0	+ 5.4	52,556	55,001	— 4.5
Dist. 3—Upper Gulf	519.3	509.2	491.5	+ 5.7	151,774	165,338	— 8.2
Dist. 4—Lower Gulf-S.W.	280.6	277.1	260.3	+ 7.8	85,326	85,767	— 0.5
Dist. 5—East Central	54.3	51.7	54.4	— 0.2	18,110	17,552	+ 3.2
Dist. 6—Northeast	394.4	381.5	402.1	— 1.9	129,297	130,458	— 0.9
Dist. 7-B North Central	118.4	110.6	83.5	+ 41.8	31,610	27,607	+ 14.5
Dist. 7-C—West Central	184.0	178.0	120.1	+ 53.2	48,020	34,714	+ 38.3
Dist. 8—West	1,046.8	1,014.2	977.9	+ 7.0	316,233	313,985	+ 0.7
Dist. 9—North	191.7	186.5	158.3	+ 21.1	55,969	51,994	+ 7.6
Dist. 10—Panhandle	80.8	82.4	83.3	— 3.0	27,410	29,193	— 6.1
Utah	5.1	4.9	4.5	+ 13.3	1,563	1,274	+ 22.7
Virginia	0.1	0.1	.....	.....	14	11	+ 27.3
West Virginia	6.9	7.2	7.4	— 9.5	2,355	2,532	— 7.0
Wyoming	193.1	194.3	182.5	+ 5.8	62,014	62,406	— 0.6
Total United States	6,633.0	6,530.1	6,271.7	+ 5.8	2,091,110	2,052,879	+ 1.9





News Analysis

Oil Industry Will Aid in U. S. Search for Uranium

A five-point program has been worked out whereby oil companies can profitably broaden their $1 billion per year hunt for oil to include a search for scarce and vital uranium, the raw material of atomic energy. The plan has been developed at the request of the U. S. Atomic Energy Commission.

While the petroleum industry's 10,000 man army of scientifically trained explorers are searching for oil and gas, they can also be systematically looking for radioactive minerals. The practical plan for ferreting out uranium has been designed by a committee formed by three professional societies of earth scientists. The committee is known as the "Advisory Committee on Radioactive Mineral Exploration." It is sponsored jointly by the American Association of Petroleum Geologists, the Society of Economic Paleontologists and Mineralogists, and the Society of Exploration Geophysicists. Chairman of the committee and principal author of the plan is Dr. Frederick H. Lahee, Sun Oil Company, Dallas. Henry C. Cortes, Magnolia Petroleum Company, Dallas, is vice chairman.

The committee is recommending that its proposed program be carried on by all oil operators as a business proposition, in the hope of making a profit, according to Curtis H. Johnson, General Petroleum Corporation, Los Angeles, president of the Society of Exploration Geophysicists. The plan is now being presented to oil companies throughout the nation by the joint committee of the sponsoring groups, which also are informing their scientist members of their parts in the plan.

The committee is pointing out to all oil operators that at a small additional cash expense, plus some time expenditure by their scientific employes, it could be possible for them to discover important deposits of radioactive materials, urgently needed for national security, and at the same time make monetary profit.

The Plan. The five parts of the proposed plan have been outlined as follows:

- The first part is based on the fact that the principal obstacle to discovering new supplies of uranium and thorium is limited range of detection instruments.

"Six inches of earth lying over a uranium deposit cuts in half the chances of its ever being discovered," Johnson explained. "And there's only one thousandth as much chance if there's another four feet of soil on top of the radioactive deposit."

But oil industry explorers drill over 4000 shallow test holes each day in the U. S. and Canada. The holes average 75 to 100 feet in depth, and are used for seismic testing of underground structures.

The first part of the plan, said the geophysicists' president, calls simply for checking the material excavated from the shallow holes for radioactivity by special follow-up crews who would work behind the seismograph crews.

"This simple effort would mean that thousands of square miles of our continent could be checked for buried uranium deposits each day at virtually no cost whatsoever," Johnson stated. "Surface prospecting just can't do this job."

- The second part of the plan is that all the material drilled out in the first 500 feet in each of the 1000 or more wells drilled for oil and gas each week be checked for radioactive materials in the same manner as the materials from shallow seismic exploration holes.
- To encourage the thousands of surface geologists employed in the oil industry to be alert for the clues of radioactive deposits. Oil companies would be urged to equip these trained earth scientists with detection devices which they would use while they hunted oil in thousands of square miles of the nation, often on foot in remote and barely accessible areas.
- That a radioactive device already used in oil well drilling, the gamma ray log, be utilized to check the first 500 feet of drilling, a process which is not usually followed in oil field practice, since that portion of an oil well rarely is of interest to oil men.
- Finally, to alert all oil industry engineers and technical people handling gamma ray logs to watch for evidence of unusually high radioactive materials. This part of the plan already has been put into action.

Oklahoma Governor Plugs the IPE

Governor Johnston Murray of Oklahoma is the first chief executive of a state to act as "Ambassador" for the International Petroleum Exposition to be held in Tulsa next May and at a recent meeting of the Tulsa Chapter Nomads reported that he expects over 400 foreign visitors from South America to attend the big oil show.

Named "IPE Ambassador" by oil show executives and the Nomads, Governor Murray toured most of Latin-America bringing good will greetings and invitations to attend the show to heads of states, prominent oil officials in the various governments contacted, as well as to American executives residing in those countries.

"I can assure you and the oil industry that everywhere I went the message I brought was received with enthusiasm," the governor reported. "Our Latin-American friends are looking forward eagerly to the oil show and will come to Tulsa next May. I had no trouble "selling" the exposition and I anticipate more Latin-Americans will attend the show than ever before."

Governor Murray speaks Spanish and is well acquainted with the countries he visited. Recently he was honored in Mexico City by being named "guest of honor" and presented with a gold medal as a token of the friendship he has shown towards that and other Latin-American countries.

The governor showed some 1600 feet of colored motion pictures taken during his trip, and described the scenes to Nomads and their guests who attended the dinner. At the conclusion of the meeting Governor Murray pledged to be on hand during the entire week of the exposition to greet the foreign visitors and to do everything possible to make the show a success.

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Oil Storage Needs Estimated

For every 50 barrels of actual inventory of oil held in storage, the petroleum industry must maintain approximately 100 barrels of petroleum storage capacity. This was revealed through a recent survey of the National Petroleum Council.

This large storage capacity, an important factor in oil industry costs, is necessary to maintain normal flexibility of industry operations. The high ratio of total storage capacity in service to the actual inventories of crude oil and refined products held in storage is essential, the report stated, if difficulties in processing, handling, and distribution are to be avoided and if the industry is to operate efficiently and well.

The survey showed that the industry's capacity to store and handle crude oil and refined products has increased greatly in the past four years, particularly in the clean products group. The study also indicated increases over the past four years in unavailable inventories or amount of crude and products that must be "locked up" in the industry's far flung operating system before normal operating levels can be achieved.

Total capacity for storage of crude oil in tanks above ground in the U. S. amounted to 429,400,000 barrels on March 31, 1952. Total crude oil in tanks and pipe lines, tankers, etc., was 238,400,000 barrels. The amount in tanks alone was 192,700,000, indicating above ground storage tanks to have been 44.9 percent full. The combined total of all unavailable stocks of crude amounted to about 63.3 percent of all of the crude oil in storage on March 31, 1952.

Total storage capacity assigned to clean products March 31, 1952, amounted to 425,500,000 barrels, and there were 203,800,000 barrels of products, stored therein, thus indicating assigned capacity to have been approximately 47.9 percent full on the date indicated. It was expected that total storage capacity for these products would be approximately 443,100,000 barrels by December 31, 1952.

Of the 220,300,000 barrels of clean products reported as in storage on March 31, 1952, 87,000,000 barrels or about 39.5 percent of reported inventories were unavailable for shipment. Included in this figure was 8,200,000 barrels required for pipe line fill and 8,300,000 barrels average unavailable in transit by tanker, barge, tank car and truck.

None of the figures in the NPC report includes stocks or storage capacity, if any, in the hands of the military.

Higher Spraberry Recovery Promised

A new production method promises a substantially higher percentage of recovery of the hard-to-get oil in the far-flung Spraberry formation in West Texas. The method was described at the annual meeting of the American Petroleum Institute in Chicago in November. Details were given by E. R. Brownscombe and A. B. Dyes, of the Atlantic Refining Company, Dallas, which is pioneering the new method. Title of their paper was, "Water Imbibition Displacement—A Possibility for the Spraberry."

Although it gives a very poor primary recovery, the Spraberry formation would not be suitable for gas or water injection, because fracturing and its tight matrix material would cause excessive channeling, Brownscombe and Dyes stated.

However, the Spraberry rock tends to soak up water with the release of oil, and the large fracture system provides a conducting system to bring injected water into contact with large areas of the matrix. Consequently, there has been conceived a "water imbibition displacement" process for the Spraberry, with a pattern of injection and producing wells similar to that for conventional water flooding but controlled by the "natural imbibition rate" into the matrix.

A unique feature of the process, said the authors, is that the produced water-oil ratio will be a function of the water injection rate and the imbibition rate rather than solely of the degree of depletion, as in conventional flooding.

A field test now is being undertaken to confirm the commercial feasibility of the process, according to Brownscombe and Dyes. Laboratory studies on rates of natural imbibition, coupled with estimates of the extent of fracturing, have indicated that the process may be carried on at commercially economic rates and that it will result in a threefold increase in recovery over that for natural depletion.

It has been estimated that by primary recovery methods, only about 10 percent of the oil in place would be recovered from the Spraberry. There is an urgent need, therefore, for some alternate method of production which will give a higher recovery.

In the field, the water imbibition displacement process would utilize a set of injection wells and of producing wells, perhaps in a five-spot or nine-spot pattern. Near the injection wells the fractures would be well filled with water. This water would be soaking into the matrix, causing oil to flow into the fractures and to be carried on to the production wells.

Producers in U. S. Now Exceed 12,000

There are over 12,000 petroleum producers in the U. S., according to a recently completed three-year study by the Oil Industry Information Committee. The count of petroleum refiners is 270, plus an additional 243 manufacturers of lubricants and greases not made in refineries. Pipe line companies number 54.

There are 42 tank ship companies, 174 barge line companies, and 61 tank car companies. For-hire contract-carriers offering tank trucks number 1063. There are over 14,000 ownerships of petroleum bulk stations and terminals; more than 11,000 fuel oil dealers; and about 5500 liquefied petroleum gas dealers.

(All businesses engaged in production, refining, transportation and wholesale distribution of petroleum and petroleum products total 44,602.)

The study revealed a total of 188,253 service stations, of which 177,923 are single-unit establishments and are classified as separate businesses. The committee stated that 95 percent of these service stations are independently owned or operated by local businessmen.

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'Shortage Hinges on Price Relief'

A substantial shortage of crude oil on the West Coast seems likely to continue during 1953 unless a price adjustment is made. R. G. Follis, Board Chairman of Standard Oil Company of California, in making this prediction pointed out that imports into the West Coast area, during the final quarter of 1952, were running at the rate of about 60,000 barrels per day and, under current price ceilings, such imports were not economic.

Follis, in addressing a recent meeting in Los Angeles, went on to say that the military now is buying some 50,000 barrels of products daily on the Gulf Coast but would prefer to buy on the West Coast if it could.

West Coast companies, he said, have been importing oil from a number of sources, including South America, the Gulf Coast, Sumatra, Borneo and Saudi Arabia and, to meet some emergencies, some has been brought in by railroad tank car from West Texas and Utah. He attributed the increased demand to rapidly increasing growth in both industry and population as well as military demand.

Referring to several different petitions that have been made to the Office of Price Stabilization for increased crude oil prices, and for commensurate product price increases, Follis said, "We are hopeful that the necessary remedial action will be taken soon so that these imports may be continued."

PAD Told of California Needs

The Oil Producers Agency of California, in an analysis sent to Deputy Petroleum Administrator for Defense J. E. Warren by D. T. Staples, president of the agency, has recommended that PAD allocate 55,825 tons of tubular goods per quarter to California for the drilling of 3190 wells in the state during 1953.

Each of these wells, it was stated, will require 70 tons of tubular goods, based on the 1947-1951 average depth of 4113 feet and the average 17.02 tons of steel per thousand feet of hole drilled.

All but a small part of the tubular goods available, the agency said, must come through PAD. During the past two years, California operators have reduced their inventories, have salvaged and used second-hand pipe, reclaimed pipe, as well as line pipe and foreign pipe to supplement allocations. These sources, with the possible exception of foreign, the analysis stated, have been largely exhausted.

The report pointed out that an emergency exists in District 5 and that the shortage is limited to California production. The only way it can be overcome, the analysis went on, is by allocation of sufficient tubular goods to permit development of the state's resources.

Refining Capacity Is Keeping Pace

Refining capacity of the petroleum industry is being expanded steadily, in line with the continuing increase in demand for the industry's products. Operable refining capacity in the U. S. on December 31, 1952, was 7,585,100 barrels per day, an increase of 350,000 barrels or five percent over that of 7,228,500 daily at the end of 1951. These figures were revealed by the American Petroleum Institute recently, on the basis of a new survey.

The report also embodied estimates for the first three quarters of 1953 and forecasted a further increase of 167,700 barrels per day to a total of 7,742,800 daily by next September 30.

Operable refining capacity is an index of the industry's ability to process crude oil with existing equipment and convert it into useful products and compounds. The API figures do not include 28,000 barrels daily that were in need of major repairs and shut down as of last September 30, or 93,000 barrels shut down though operable because considered to be in the high cost marginal group.

The report stated that figures for 1952 included about 293,000 barrels per day in which the crude oil is charged direct to cracking units.

The 7,585,100 barrels per day of operable refining capacity as of December 31, 1952, includes data by districts as follows: East Coast 1,103,500 barrels daily, Appalachian District One 123,700, Appalachian District Two 87,600, Indiana-Illinois-Kentucky 1,398,900, Oklahoma-Kansas-Missouri 651,500, Inland Texas 297,000, Texas Gulf, 1,786,700, Louisiana Gulf 525,600, North Louisiana-Arkansas 93,200, New Mexico 22,400, Other Rocky Mountain 261,000, and California 1,234,000.

By September 30, 1953, the U. S. total will be up to 7,742,800 barrels daily, and this will include: East Coast 1,122,500, Appalachian District 1 128,700, Appalachian District 2 87,600, Indiana-Illinois-Kentucky 1,422,800, Oklahoma-Kansas-Missouri 671,900, Inland Texas 304,600, Texas Gulf 1,800,300, Louisiana Gulf 587,400, North Louisiana-Arkansas 95,600, New Mexico 22,400, other Rocky Mountain 261,500, and California 1,237,500.

Line Would Aid Canada Producers

Western Canada producers stand to benefit materially if and when Interprovincial Pipe Line Company should extend its existing line, which terminates at Superior, Wisconsin, to Sarnia, Ontario. Although final plans have not as yet been released for construction of the recently-announced proposed extension, it is felt that such a line would eliminate much of the seasonal fluctuation which now exists due to the annual winter freezing-up of the Great Lakes and resultant stoppage of winter tankers which now bridge the gap between lakehead and the Sarnia refining center.

Construction of such an extension would tend to level out month-to-month earnings of oil producing companies; also would permit more normal, uninterrupted producing of leases and many related oil field and pipe line operations which now suffer curtailment during winter months.

Preliminary reports state that the proposed extension would be of 30-inch pipe and would be about 625 miles long. Initial capacity of the extension would be in the order of 85,000 barrels per day but, by addition of additional pumping capacity, it could be increased several-fold.

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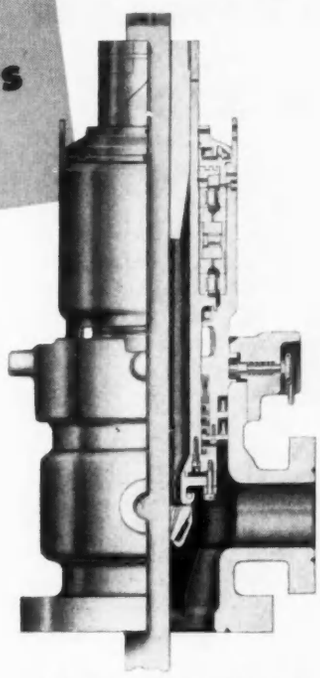
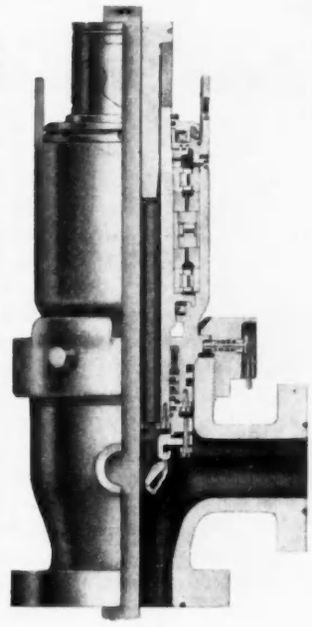
Shaffer Combination Rotating Blowout Preventers and Strippers





Both Feature the Same Field-Proven Safety and Operating Advantages!

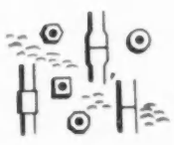
For years, the Shaffer Type 50 Combination Rotating Blowout Preventer and Stripper has been depended upon by leading operators to provide *automatic* protection against pressure emergencies while drilling. Now, to meet the wide-spread demand for a smaller unit to provide the same dependable protection, Shaffer brings you the *new* Type 51 Combination Rotating Blowout Preventer and Stripper.

The new Type 51 incorporates the same fool-proof sealing principle, the same wide-range versatility and safety—except that it is of smaller size to make it more readily adaptable to various classes of work.

USE THE TYPE 50
for all kinds of drilling operations . . . and it is especially recommended for use in drilling through 10¾" casing and larger.

USE THE TYPE 51
for protecting against blowouts in slim hole drilling, drilling-in, production jobs, reworking of wells and remedial work.

Both Type 50 and Type 51 incorporate these unique advantages . . .



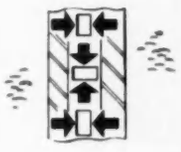
Seals Varying Diameters and Shapes
In both units, the Stripper Rubber expands and contracts **automatically** to fit the varying diameters and shapes of the drill string (excepting such abnormally large diameters as bits and reamers). It seals around any shape—round, square, hexagonal or octagonal—and varying diameters of pipe, couplings, drill collars, subs, etc. **No manual adjustment is necessary!**

Unusually Compact
Both units are amazingly compact and can be installed under even the most difficult space limitations. Not only are vertical and horizontal dimensions kept to the minimum, but even the flow connections are built directly into the body, simplifying hook-ups and eliminating need for spools or similar equipment.

Continuous Seal
A pressure-tight seal is maintained without need for applying mechanical or hydraulic pressure of any kind from the outside . . . and the seal **automatically** adjusts itself to the varying shapes and sizes in the drill string. The operator can **drill** under pressure, and can also **strip** pipe in and out of the well under pressure—**all without adjustments or changes in the unit!**

Steel Protected Stripper Rubber
A patented expandable barrier of hinged steel latches prevents the Stripper Rubber from extruding—either by high pressure or by pulling large diameters through it. Yet full flexibility of the rubber is assured.

Unusually Long Life
The Stripper Assembly rotates freely **with** the kelly—not one inside the other. Thus, there is virtually no wear on the rubber, assuring negligible maintenance and maximum safety. The bearing assembly upon which the unit rotates has separate thrust and radial bearings to withstand any combination of loads due to high pressure and high speed drilling—and bearings are prepacked with a high temperature and high speed stabilized grease.



Passes Large Diameters
Unusually large-diameter tools such as bits and reamers can be passed through the unit with maximum ease, safety and simplicity by merely pulling a spring latch, rotating the bonnet 1/6th turn, whereupon the entire internal mechanism can be withdrawn as a unit to permit passing the bit or reamer.

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Completions in November

Drop Sharply to 3704

NOVEMBER'S COMPLETED wells totaled 3704, dropping substantially from the 3978 recorded in October. Normally, declines in drilling rates occur in the last several months each year, but this decrease was more pronounced. Perhaps part of the answer was that October's records included some wells that would have been completed during the previous several months, but whose completion date was delayed by insufficient pipe.

The year's wells continued to hold a lead over last year's, but it is quite possible that by the end of December the lead will have changed hands. There won't be a great deal of difference between the two periods, whichever year ends up with the most wells drilled. Of course, when the amount of footage drilled is concerned, the current campaign is far ahead of last year or any other year. When the records are completed, they will show that about 10 million feet more were drilled this year than in peak 1951. That will amount to a gain of slightly more than 5 percent.

In the first 11 months of this year, a total of 172,185,899 feet were drilled. That means that each new well drilled this year was 4082 feet deep on the average. This will be the first time in history that per well average was as deep as 4000 feet. The record set in 1951 was 3862 feet at the end of November and ended the year a little less than that.

Texas, continued to maintain its usual position of leading drilling state in the nation. It has this year accounted for 38.5 percent of the country's wells and 45.2 percent of the footage drilled. Its new wells were deeper than the national average by 716 feet, by averaging 4798 feet. The number 2 state was Oklahoma with 12.3 percent of the wells and 11.4 percent of the hole drilled. The per well average of 3778 feet was somewhat more shallow.

Kansas, the Number 3 drilling state accounted for 9.3 percent of all wells, but only 7.9 percent of the footage. Its well average was 3469 feet. California's wells and the attending footage amounted to almost the same, being 5.4 and 5.6 percent respectively.

Of the leading drilling states, Louisiana's wells were the deepest. Each new well averaged 6625 feet. The states total footage amounted to 8.5 percent of the nation's, while its wells totaled 5.2 percent.

Wells Completed in the United States During November, 1952, and First Eleven Months, 1952

State or District	MONTHLY COMPLETIONS, NOVEMBER, 1952									TOTAL COMPLETIONS				CUMULATIVE TOTALS January-November					Rigs in Operation (Drilling, Rigging Up and Shut Down)		
	NEW WELLS								Total Drilled Deeper												
	Oil	Dist.	Gas	Dry	Water Input	Gas Input	Water Disposal	Total New		Nov., 1952	Oct., 1952	Nov., 1951	Footage Nov., 1952	Wells 1952	Wells 1951	Percent Diff.	Footage 1952	Footage 1951	Nov. 30, 1952	Oct. 31, 1952	Nov. 30, 1951
Alabama	6			2				8		8	8	2	52,890	64	51	+ 25.5	391,490	249,545	6	6	4
Arizona											1	1		2	4	— 50.0	10,755	8,635	2	3	2
Arkansas	19			20				39		39	51	38	122,742	398	392	+ 1.5	1,470,178	1,383,728	36	36	36
California	144		7	56				207		207	197	189	930,534	2,322	2,248	+ 3.3	9,719,938	8,630,627	253	242	275
Colorado	9		2	42				53		53	61	39	273,713	445	264	+ 68.6	2,335,238	1,283,882	40	49	47
Florida											1			7	3	+133.3	45,407	14,614	3	2	2
Georgia																				1	
Idaho															1	—100.0		12,844	3	3	1
Illinois	85		3	146				234		234	226	188	635,832	1,970	2,186	— 9.9	4,915,987	5,444,963	192	201	228
Indiana	34		1	66	2			103		103	118	159	193,031	1,180	1,269	— 7.0	2,111,172	2,293,977	179	162	184
Kansas	134		25	146			2	307		307	392	425	1,064,447	3,896	3,905	— 0.2	13,516,940	13,408,263	442	410	433
Kentucky	34		16	53				103		103	100	109	201,370	1,088	1,198	— 9.2	2,210,850	2,457,870	111	102	106
Louisiana	112	8	13	80				213	1	214	252	233	1,341,759	2,203	2,083	+ 5.8	14,537,733	13,103,489	237	225	247
North Louisiana	68	1	10	44				123	1	124	143	154	451,493	1,222	1,176	+ 3.9	4,684,155	4,504,897	56	61	73
South Louisiana	44	7	3	36				90		90	109	79	890,266	981	907	+ 8.2	9,853,578	8,598,592	181	164	174
Maryland			1	1				2		2		7	11,086	34	37	— 8.1	136,053	155,430	4	6	31
Michigan	14		1	26				41	1	42	54	57	113,413	587	652	— 10.0	1,580,604	1,646,142	88	90	114
Mississippi	8		1	20				29		29	25	40	218,640	313	352	— 11.1	2,255,675	2,343,068	38	37	36
Missouri														30	4	+650.0	30,192	2,717	4	3	5
Montana	16			19	1			36		36	47	23	121,100	283	258	+ 9.7	980,370	609,922	61	66	49
Nebraska	6		2	7				15		15	39	19	74,316	228	164	+ 39.0	1,135,203	782,496	16	18	20
Nevada															2	—100.0		15,431		1	1
New Mexico	36	1	30	22				89		89	91	68	475,717	1,019	648	+157.3	5,608,179	3,176,830	178	180	166
New York	54				34			88		88	99	51	122,412	994	494	+101.2	1,379,842	705,904	108	121	56
North Dakota	9			9				18		18	18	1	132,844	78	9	+766.7	656,812	44,419	33	29	11
Ohio	48		28	30				106	2	108	105	83	226,224	927	854	+ 8.5	1,978,977	1,731,738	163	171	156
Oklahoma	229	2	35	180	4			450	8	458	478	462	1,735,852	5,301	5,181	+ 2.3	19,623,227	18,627,810	595	561	631
Pennsylvania	58		18	6	55	7		144	2	146	140	143	247,677	1,572	1,440	+ 9.2	2,656,974	2,469,847	250	246	243
South Dakota											2	2		5	2	+150.0	20,531	3,340	3	1	3
Tennessee															6	—100.0		7,465	5	5	7
Texas	643	12	64	542	5			1,266	17	1,283	1,350	1,533	6,097,321	16,410	16,615	— 1.2	77,788,367	72,744,752	1,345	1,381	1,801
Dist. 1 S. Central	23		3	25				51		51	98	73	158,617	715	584	+ 22.4	2,109,137	1,602,039	35	46	49
Dist. 2 Middle Gulf	28	1	11	37				77	1	78	72	86	489,471	765	724	+ 5.7	4,854,063	4,253,145	54	46	66
Dist. 3 Upper Gulf	64	11	6	59				140		140	129	116	1,044,756	1,638	1,406	+ 16.5	10,826,802	8,781,072	131	142	122
Dist. 4 L. Gulf-S.W.	59		13	48				120		120	121	161	707,359	1,486	1,584	— 6.2	7,904,004	7,887,247	104	122	122
Dist. 5 E. Central	4		2	13				19		19	29	39	97,507	323	443	— 27.1	1,610,955	1,831,745	17	20	29
Dist. 6 Northeast	12		9	9				30		30	30	48	179,869	473	635	— 25.5	2,899,804	3,270,081	43	43	45
Dist. 7-B N. Cent.	104		2	134				240	4	244	212	198	703,873	2,542	2,563	— 0.8	7,930,200	7,435,687	143	116	188
Dist. 7-C W. Cent.	80			42				122	2	124	160	150	662,086	1,930	1,389	+ 38.9	11,178,898	6,516,157	141	162	255
Dist. 8 West	143		1	49				193	8	201	206	358	1,137,144	3,097	3,720	— 16.8	17,358,250	20,288,287	335	343	528
Dist. 9 North	112		1	121	5			239	2	241	276	241	812,137	2,914	2,741	+ 6.3	9,436,725	8,227,506	267	266	272
Dist. 10 Panhandle	14		16	5				35		35	17	63	104,502	527	826	— 36.2	1,679,529	2,651,786	75	75	125
Utah	1		2	5				8		8	9	7	49,019	74	34	+117.6	468,881	174,085	29	27	33
Virginia																					1
Washington																					1
West Virginia	6		28	9				43	2	45	41	67	117,261	532	602	— 11.6	1,564,600	1,714,288	182	185	200
Wyoming	31			36				67	2	69	73	46	312,337	608	692	— 12.1	3,025,724	3,476,914	83	89	104
Total U. S.	1,736	23	277	1,523	101	7	2	3,669	35	3,704	3,978	3,992	14,871,537	42,570	41,650	+ 2.2	172,185,899	158,725,035	4,689	4,659	5,234

What's Ahead In '53?

- **Fair prices a major goal.**
- **Steel supply causes concern.**
- **Supply-demand balance needed.**
- **Politics in the spotlight.**

THE industry must have fair prices for its crude and products. That is a major goal for 1953, according to executives who participated in WORLD OIL's third annual symposium on major problems to be encountered during the new year.

In addition to prices, the executives expressed greater concern over the steel supply, a proper balance between supply and demand, and the problem of righting the wrongs inflicted by the outgoing administration.

Their statements:

K. S. ADAMS, Chairman,
Phillips Petroleum Company

WHEN ASKED TO prepare a statement for this publication last year on the major problems most likely to confront the oil industry in 1952, I emphasized the necessity for a crude oil price increase. Today, I feel even more keenly that the removal of crude oil price restrictions by the Office of Price Stabilization is the first and greatest need of the petroleum industry.

K. S. Adams

As long as this country is kept in a state of defense or semi-war, the petroleum industry must provide substantial excess crude productive capacity and expand crude oil reserves. Maximum progress cannot be made in that direction until the industry is freed from governmental restrictions and receives a fair price for its products. There has been no general crude oil price increase for over five years. Unless prices are boosted to reflect present increased costs, a diminishing rate of exploration and drilling is sure to set in, and crude oil could become the weak link in the chain of national security.

Every suggestion for removal of price controls on crude oil has been rejected, even though the oil producer has been burdened with increasing costs of operation ever since the last general price increase for crude oil in 1947. In addition to higher wages and rising prices of materials, the industry has been faced with higher lease bonuses and delay rentals and the added expense of deeper drilling. It is obvious that growing costs have been and still are reducing oil producers' margins, and thus have greatly lessened the incentive to the hazards and costs of expanding production.

The reason advanced by OPS for maintaining controls on crude prices is that oil producers' profits indicate that present prices are adequate. Current earning from oil production to a great extent reflect the costs of finding and developing oil 5, 10, 20, or even more years ago. When a barrel of oil is used it must be replaced. We are now exploring for and developing tomorrow's oil at today's cost. The present crude price simply doesn't make the venture attractive.

A practical solution to the problem is to return crude oil prices to a normal and competitive market through decontrol. If the industry could be governed by the simple economic standards of supply and demand, the price of oil would bring the necessary revenue needed to meet any expansion program.

•

ROBERT G. DUNLOP, President,
Sun Oil Company

OIL COMPANIES in the postwar years have competed vigorously to maintain and improve their competitive positions in a rapidly expanding market. Bidding for a share of increased consumer and military needs, they invested more than $17 billion for expansion and modernization in the seven years from 1946 through 1952. As a result they met in full a total U. S. demand that rose an amazing 44 percent—or 2,385,000 additional barrels per day—in that period.

They will be called upon to supply even more oil in 1953. Consumer and government spending, and capital investment by manufacturing industry, are expected to continue at high levels, indicating a comparably high level of business activity. The oil industry has never suffered under such circumstances.

R. G. Dunlop

But the exceedingly sharp upward trend in postwar demand for petroleum is leveling off. Demand in 1952 was only 3.3 percent over 1951, in contrast with increases of 11.1 and 9.6 percent, respectively, in 1950 and 1951 over the year immediately preceding. The probabilities are that demand in 1953 will rise somewhat between 3 and 5 percent.

Meanwhile, the momentum of the industry's postwar expansion effort has carried oil company capital expenditures upward to a 1952 level exceeding all previous years. And indications are that the industry will be building ahead in 1953 at only a slightly diminished rate. In this, oil companies are being encouraged by the Federal government. The Petroleum Administration for Defense has urged the development of a cushion of reserve production capacity of 25 percent.

Whether or not the industry can afford a cushion of that magnitude remains to be seen. It is likely, in any event, that oil companies will at least equal in 1953 the record total of better than 46,000 wells drilled in 1952.

With productive capacity still rising and demand leveling off, the outlook for the industry in 1953 is one of intensified competition. The industry is entering the new year with an abundance of both crude oil and products in inventory. Assuming no sharp change for the worse in the Korean war, or new outbreaks on other world fronts, the industry has current supplies and potential productive capacity more than adequate to meet anticipated needs.

Consumers therefore can expect

'. . . government understanding is essential.'

competition increasingly to exert a healthy upward pressure on product quality and an equally healthy downward pressure on prices. The effect of the current supply-demand balance already is apparent in the fact that some products, notably lubricating oils and heavy fuel oils, are selling generally below ceiling prices. Gasoline also is priced below ceiling in a number of areas of the country.

This is just further evidence that there is no argument to justify price or wage controls on the industry. Oil company managements, faced with higher costs which have not been offset by higher prices, will need a maximum of resourcefulness and flexibility to improve efficiencies and hold costs below going market prices. Controls curb resourcefulness and impose rigidities upon operations.

The economic trends which point to harder competition in 1953 are healthy not only for consumers but for the oil industry as well, for it has traditionally made its greatest progress at such times. The actions of the new administration will have a significant influence on the outcome of these trends. It is to be hoped that they will not be counteracted by further inflationary policies, but instead encouraged by government economy and a more satisfactory tax structure giving recognition to economic incentives.

•

B. BREWSTER JENNINGS,
President, Socony-Vacuum Oil Company

THE OIL INDUSTRY'S main task in 1953 will be that of continuing to meet the challenge presented by the ever-increasing worldwide demand for more and better petroleum products.

B. B. Jennings

To an industry that has never stopped growing, the challenge of continued growth is familiar. It differs today only in degree. The cost of finding, producing, processing, moving and delivering more oil has been increasing at an accelerated tempo under the combined impact of inflation, exploration and development in inaccessible areas, and deeper and deeper drilling.

Great amounts of capital obviously will be required. Full understanding of this need, particularly by governments, is essential if the job which lies ahead is to be done.

•

J. L. LATIMER, President,
Magnolia Petroleum Company

IN DISCUSSING new problems that face the oil industry, I would like to point out that nearly all of our present problems are ones with which our business has been confronted before. They are simply clothed differently in our ever-changing economic world of today.

J. L. Latimer

Our chief problem is that of keeping the proper balance of supply and demand for petroleum and its products and directing, when possible, the several variable factors that affect that balance.

During the last few years there has been a tremendous expansion of the industry. This, coupled with inflation, greater exploratory efforts in the search for more crude reserves, and deeper drilling, has been exceedingly expensive.

The postwar expansion of the industry has cost some $25 billion. These vast expenditures were necessary because of competition and to meet the growing demand for petroleum products, which has been increasing 8 percent to 9 percent annually since the war. Some of this demand, of course, was for oil for our fighting forces and to help supply the free world.

It now appears that domestic demand will not continue its rate of increase, and we may be faced with a slackening in military demands for petroleum products. At the same time, the oil industry realizes its responsibility for building up adequate reserve capacity as a safeguard for a possible world war. This calls for exploring for new oil provinces not only in the U. S. but in Canada, the Gulf of Mexico, and throughout the world. It also demands continued expansion in transportation and refining facilities.

I believe these problems of supply and demand, together with other problems with which the industry is faced, can be solved if the industry is allowed to operate with freedom of business action.

Though progress has been made in the last several years in widely disseminating information about the oil business to the people, there still remains a need for greater public understanding of the industry and appreciation of the services that oil renders this nation and the rest of the free world.

•

T. S. PETERSEN, President,
Standard Oil Company of California

LOOKING AHEAD into 1953, three subjects seem to contain the petroleum industry's major problems during the next 12 months. These are:

PRICE—Most of us recognize that rigid controls by the OPS are making imposed price levels a growing burden. In almost every activity costs are rising, month on month. Because, to date, no price relief has been allowed, this situation has put a squeeze on the profits of an industry so highly integrated as ours. Unless the reasonable price increases which have been requested are granted by the OPS, it seems probable that the industry will be forced to curtail at least a part of its needed development and expansion program.

T. S. Petersen

STEEL—The steel strike earlier this year had an adverse effect on the industry's drilling program, an effect which would have been worse except for the foreign and conversion steel purchased at large premiums. Demand for steel is still far ahead of supply, and prospects are that this tight situation for the types of steel required by the oil industry will maintain at least until mid-year.

SUPPLY-DEMAND—It looks as though demand for oil products is still on the ascendant curve, but the increase in total demand for the year ahead should not be as marked as it has been in the past couple of years. Against this, there appears to be plenty of foreign crude available, and some domestic crude is pressing for outlets. Although rising demand is still to be a condition facing us, it may not be as much of a problem in 1953 as it has in recent years.

'. . . undo harm of current administration . . .'

REESE H. TAYLOR, President,
Union Oil Company of California

THE PROBLEMS of greatest concern to the Pacific Coast oil industry are those resulting from the imposition of rigid ceiling prices under price stabilization. These ceiling prices have for some time been seriously hampering the operations of the industry to the extent that it is prevented from adequately supplying civilian and defense needs.

R. H. Taylor

During the past year Union's crude oil supplies fell so far short of our needs that it was necessary to ration civilian sales of premium gasoline and to discontinue supplying a portion of our normal diesel oil market. Inventories dropped so low that we were forced to engage in uneconomical expedients for distribution of products.

The same difficulties have been experienced, to a varying degree, by the other members of the Pacific Coast oil industry. This is amply demonstrated by the fact that the Pacific Coast oil industry as a whole is unable to provide the full amount of products requested by the military from this area, and by the fact that uneconomical imports of crude oil have been made.

The basic cause of these difficulties is the present inadequacy of crude oil production in California. Unfortunately, the ceiling prices to which we are now limited do not provide sufficient incentive for discovery and development activity of the magnitude needed, nor do they permit adequate importation of higher cost crude oil and products until production matches demand.

To provide relief during the period in which price ceiling regulations continue to operate, Union has submitted an application to the OPS calling for increases in crude oil and product ceiling prices. Applications have also been submitted by two other members of the industry, but to date there has been no positive indication that any of these applications will be acted upon favorably.

This problem can be permanently resolved only by the elimination of these artificial controls, so that normal economic forces can operate to bring supply and demand in the area into balance.

•

J. S. LEACH, President,
The Texas Company

AS WE CONTEMPLATE the change to a new administration in Washington, it is obvious that one of the greatest problems and opportunities facing the oil industry in 1953 will be to begin undoing the harm resulting from some of our government's actions during the current administration.

J. S. Leach

An example of the harm that has been done is the recent publication of the Federal Trade Commission staff report on "The International Petroleum Cartel." Despite the often proclaimed objective of our government to give assistance to underdeveloped areas abroad by increasing investments in such areas, the FTC report and subsequent action by the government are at cross purposes with that objective.

It is recognized that the oil industry has led all other groups during the postwar years in exporting American capital and technical know-how, and has brought about rapid development and very marked increase in the standards of living in the countries in which such investments have been made. A great reservoir of good will has thus been acquired, but it is apparent that this may be rapidly drained away by domestic and foreign groups who are attempting to use the FTC report to embarrass American industry.

The oil industry's big challenge in 1953 will be, therefore, to refute energetically the thesis that more government control and regulation are necessary in the petroleum industry, and to defend itself against ill-advised charges growing out of the FTC report.

•

L. F. McCOLLUM, President,
Continental Oil Company

THE OIL INDUSTRY has been confronted, in recent years, with the necessity of supplying ever increasing demands for refined products. Three distinct periods of expansion have occurred since World War II.

- The first, immediately following the war, to satisfy pentup civilian demand.
- The second, to meet the sudden upsurge resulting from the Korean War.
- The third, to offset the loss of Iranian oil.

The resulting increased capacity, coupled with record use of facilities, has been adequate to take care of all needs, sometimes in an almost spectacular fashion.

L. F. McCollum

In 1953, however, the industry may be faced with a much more rapid increase in refining capacity than in currently foreseeable demand. Completion of expanded facilities now under construction or definitely planned may result, by the end of the year, in a restoration of the 1 million barrel per day reserve refining capacity that existed before the outbreak of the Korean War. If this proves to be the case, the industry will be confronted with the problem of absorbing these additions to reserve capacity. The problem will be magnified if Iranian oil should return to the world markets during the year.

The lubricating oil markets of domestic refiners have been adversely affected by the buildup of foreign lube refining capacity. Expansion of foreign facilities for the production of other refined products may be expected to add to the problem of potential oversupply in the U. S.

The ability of the industry to adjust its operations to absorb this surplus in a rational and orderly fashion will be improved if the new administration returns to business a larger share of the management of its own affairs. It is essential that our economy be kept free by checking the trend toward socialism which has been a source of increasing concern. A return to the normal operation of the laws of supply and demand, through elimination or relaxation of controls, will permit the economic movement of supplies from areas of surplus to those of famine.

Despite the immediate possibility of oversupply, the long-range view is encouraging, because the dynamic nature of our economy indicates continuing growth in both domestic and foreign demand for petroleum and its products.

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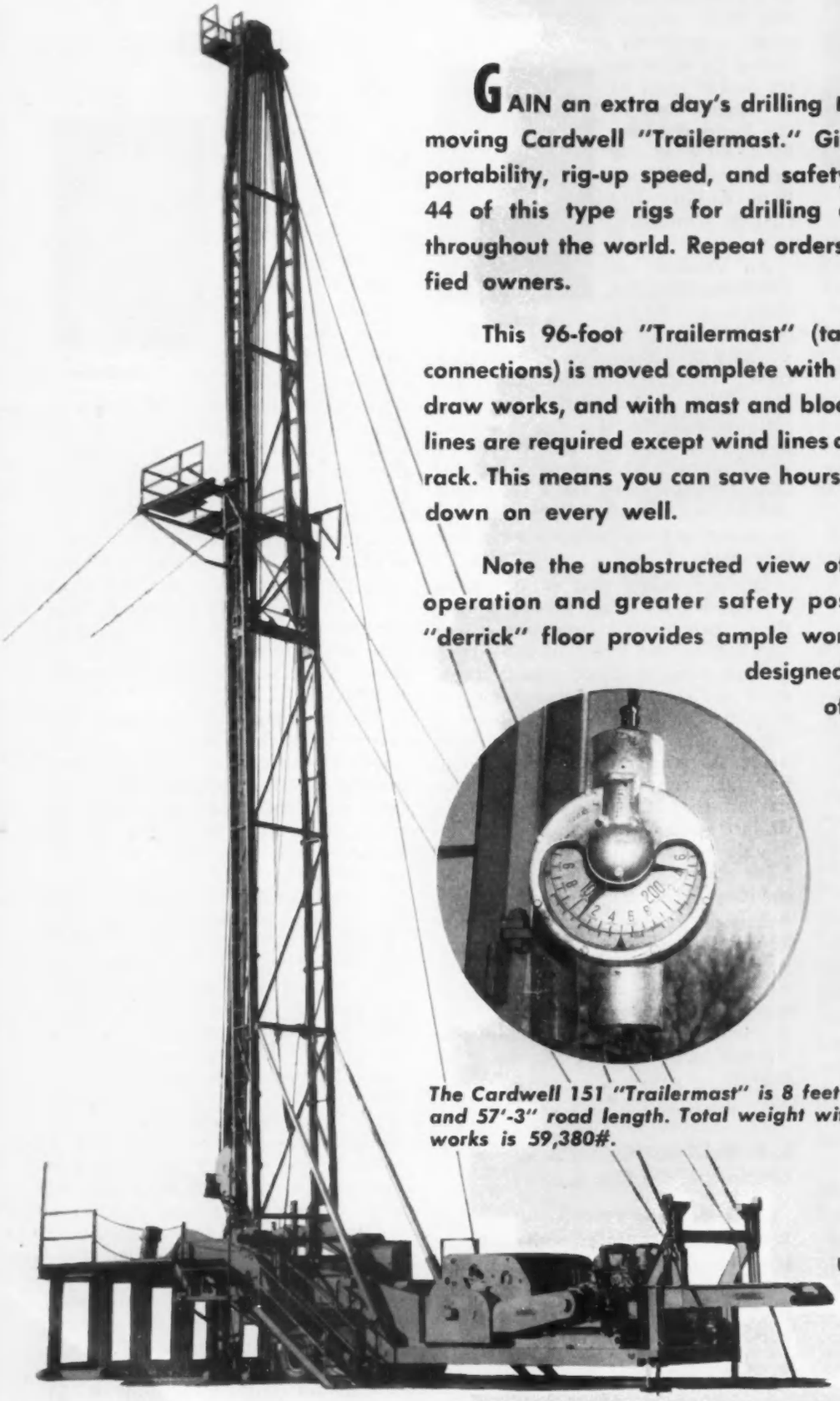

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TWENTY-FIVE YEARS CARDWELL SERVING THE OIL INDUSTRY

You Can Save Money on Taxes

When programming a drilling operation or contemplating abandonment of a lease . . . don't forget about the tax collector.

By H. O. REYBURN
Nicholson, Reyburn & Company, Tulsa

THERE ARE probably more tax cases peculiar to the oil industry alone than to any other single industry in America. This has led many oil men to adopt the attitude that the tax picture is so uncertain or so technical that he must ignore it in his day to day operations and let the taxes fall where they will. One who does this may be giving the tax collector a much greater share of his net income than is necessary.

Worthwhile tax savings come through tax planning, not in making up the tax return. There are some simple rules set forth in the regulations which can result in considerable tax saving if the operations are planned to fit these rules. Two very important factors entering into the tax picture of every oil operator are the deductions for intangible drilling and development costs and the deduction for percentage depletion. The following illustrations will show how, under certain circumstances, you can get more tax benefit from these two deductions.

For the sake of illustration, let us assume that the taxpayer makes his income tax returns on the calendar year basis.

Consider first the drilling cost deduction for the first well on a nonproducing lease. If there is a choice of time, the well should be started in sufficient time to be completed just before the year's end. In the case of cash basis taxpayers, it would have to be paid for before the year end also. This would permit the deduction of the drilling cost in a year where it would not affect the percentage depletion allowance. The difference in the amount of income subject to tax is set forth in Table 1, assuming certain facts which would bring out this point the most forcefully.

In Table 1, it will be noted that two tax years are involved in Column A — 1951 and 1952, whereas, only 1952 is involved in Column B. For the sake of proper comparison, we must assume the same average tax rate applicable to the taxpayer in all years. Variations in rates will increase or decrease the tax benefits but to follow this phase of the example, through all of the situations a taxpayer might find himself in at the year end, would lead us too far afield.

Tables 2 and 3 contemplate development on a non-producing property where a well had to be started by June 1. It was decided at the last moment to drill the well which resulted in a producer capable of paying the working interest $3000 per month and requiring the same expenditures as are set out in Table 1. The drilling program is for seven more wells on this property within the next twelve months. The question is —When should they be drilled to receive the most benefit taxwise? Tables 2 and 3 show two extremes. Economic or other factors may require a policy somewhere between these two extremes. All other factors being equal, Tables 2 and 3 are intended to show that since the drilling of the first well eliminates all percentage depletion for that year, the incurring of additional drilling costs on that property in that year will not result in any further loss of depletion allowance except for the small amount applicable to the additional income from the new wells before the year end.

The theory of the percentage depletion computation is set forth in Table 4.

The working tank in the middle represents the source of working funds, which for purposes of simplification, is derived from oil sales from the particular property.

The first syphon is to take care of the operating expenses, overhead costs, depreciation provision and intangible development costs, all of which are deductible items for in-

TABLE 1

	A Well Completed Just Prior to 12-31-51		B Well Completed Just After 12-31-51	
Income—1952		$60,000.00		$60,000.00
Deductions:				
Operating Expenses	$ 7,000.00		$7,000.00	
Overhead	1,000.00		1,000.00	
Depreciation	2,000.00		2,000.00	
Drilling Costs	—0—		50,000.00	
Total Deductions		10,000.00		60,000.00
Net Income Before Depletion—1952		$50,000.00		—0—
Drilling Cost and Depletion Deductions:				
Allowable Depletion*		$16,500.00		—0—
Drilling Costs		50,000.00		50,000.00
Total		$66,500.00		50,000.00
Net Tax Saving on Additional Deductions Assuming Tax Rate of 50 Per Cent		$ 8,250.00		
***Allowable Depletion Calculation:**				
a. 27½ Percent Gross Income		$16,500.00		16,500.00
b. 50 Percent of Net Income		25,000.00		—0—
Cost Depletion (not considered)				
Allowable (a. or b. whichever is lesser)		$16,500.00		—0—

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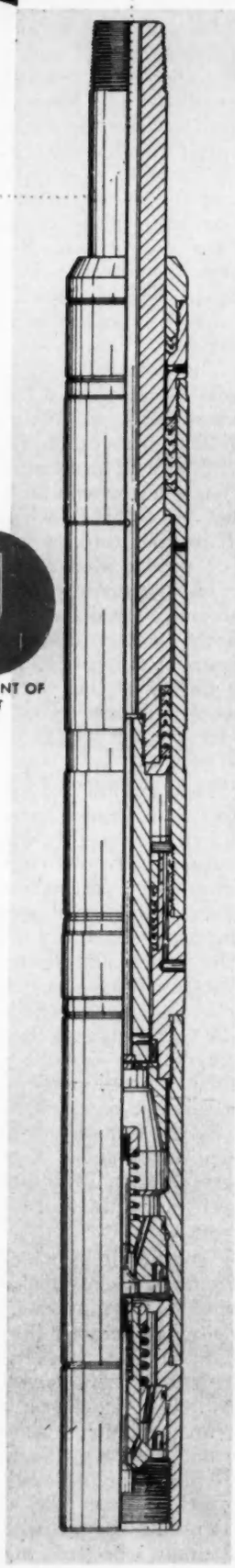

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- *YOUR TEST CAN START MINUTES FROM NOW*

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YEARS AHEAD IN DRILL STEM TESTING

come tax purposes. At this level, we have $20,000 of oil left in the tank.

Whether you want him or not, Uncle Sam is a special type of partner in your business and he has written the partnership agreement. The percentage depletion allowance is in some respects like a working partner's salary allowance. Uncle Sam has said that he will make you a special allowance each year (called percentage depletion) depending on how profitable the operation is for each year. This allowance is to be 27½ percent of the gross income from the property or 50 percent of the net income from the property, whichever is lesser. Net income is defined to be gross income less all of the items drawn off at the first syphon in Table 4. The net in this example is $20,000.

The dotted line in Table 4 represents the amount of the remaining oil it would take to provide an allowance of 27½ percent of the gross income ($13,200). This is more than half of what is left so you are limited to one-half, or $10,000, which is syphoned off to your tank to keep for yourself as a special allowance.

The remaining oil is divided between you and Uncle Sam according to the partnership agreement. In this example, it has been assumed you are in the 50 percent tax bracket, so you get 50 percent of what is left and your partner (U. S.) gets the other 50 percent.

This graphic example shows that any additional expenses which are drawn off at the first syphon level automatically reduce your special allowance by 50 percent of the additional amount syphoned off. This situation automatically comes into existence when the dotted line on the working tank gets below the second solid line. In this example, the dotted line was even with the solid line when the drilling cost deduction reached $9600. In other words, the net result is that we received the net effect of only one-half of our drilling cost expenditures above $9600 because we lost 50 cents depletion each time we spent an additional dollar on drilling costs.

Another item which is due closer attention by oil operators is the surrender of nonproducing acreage. To the wise operator, the decision to pay rentals or surrender acreage on a basis, other than on the merits of the particular acreage involved, is at first a little repulsive. At present day tax rates, however, the man who views the dollar before taxes and the dollar after taxes in the same light will eventually be many dollars short of the man who looks at all dollars after taxes. In the final analysis, it is only the dollar after taxes which you can call your own.

If an oil producer has already spent enough on drilling costs to reduce his taxable income to a small amount or to a loss, he should consider a different policy than he would if he were in high tax brackets. To illustrate the point, assume that the taxpayer owns a lease costing $10,000, which bears an annual rental of $500. At the rental date, the lease has negligible prospects and it would appear wise to release it and save $500. Assume further that the taxpayer has no net taxable income this year due

■ CONTINUED ON PAGE 72

TABLE 2

A. If All Wells Drilled Next Year	This Year		Next Year	
Income:				
Estimated Income—First Well		$ 18,000.00		36,000.00
Estimated Income—Additional Wells		—0—		189,000.00
Gross Income		$ 18,000.00		225,000.00
Deductions:				
Operating Expenses	$ 3,500.00		20,000.00	
Overhead	500.00		7,000.00	
Depreciation	1,000.00		12,000.00	
Drilling Costs	50,000.00		350.000.00	
Total Deductions		55,000.00		389,000.00
Net Income (loss) Before Depletion		($37,000.00)		(164,000.00)
Drilling Cost and Depletion Deductions:				
Allowable Depletion (27½ Percent of Gross Income or 50 Percent of Net Income, Whichever is Lesser)		$ —0—		—0—
Drilling Costs		50,000.00		350,000.00
Total		$50,000.00		350,000.00

TABLE 3

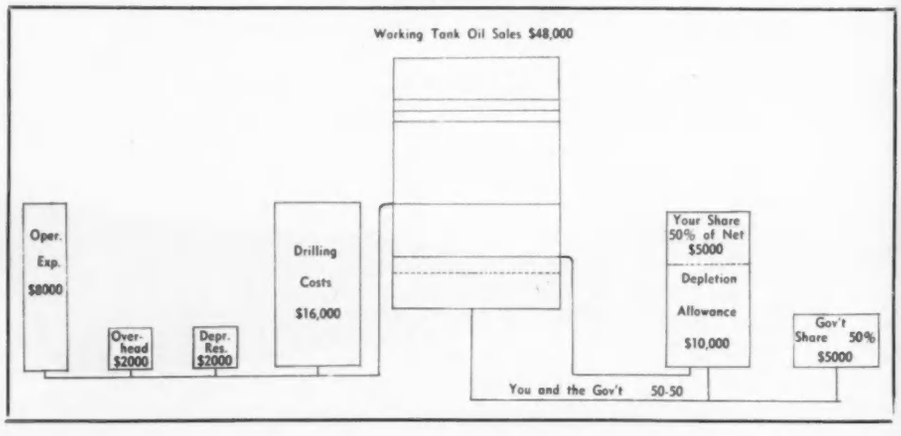
B. If All Wells Drilled This Year	This Year		Next Year	
Income:				
Estimated Income—First Well		$ 18,000.00		36,000 00
Estimated Income—Additional Wells		63,000.00		252,000.00
Gross Income		$ 81,000.00		288,000.00
Deductions:				
Operating Expenses	$ 8,500.00		25,000.00	
Overhead	2,250.00		8,000.00	
Depreciation	4,500.00		16,000.00	
Drilling Costs	400,000.00		—0—	
Total Deduc ions		415,250.00		49,000.00
Net Income (loss) Before Depletion		($334,250.00)		239,000.00
Drilling Cost and Depletion Deductions:				
Allowable Depletion (27½ Percent of Gross Income or 50 Percent of Net Income, Whichever is Lesser)		$ —0—		79,200.00
Drilling Costs		400,000.00		—0—
Total		$400,000.00		79,200.00

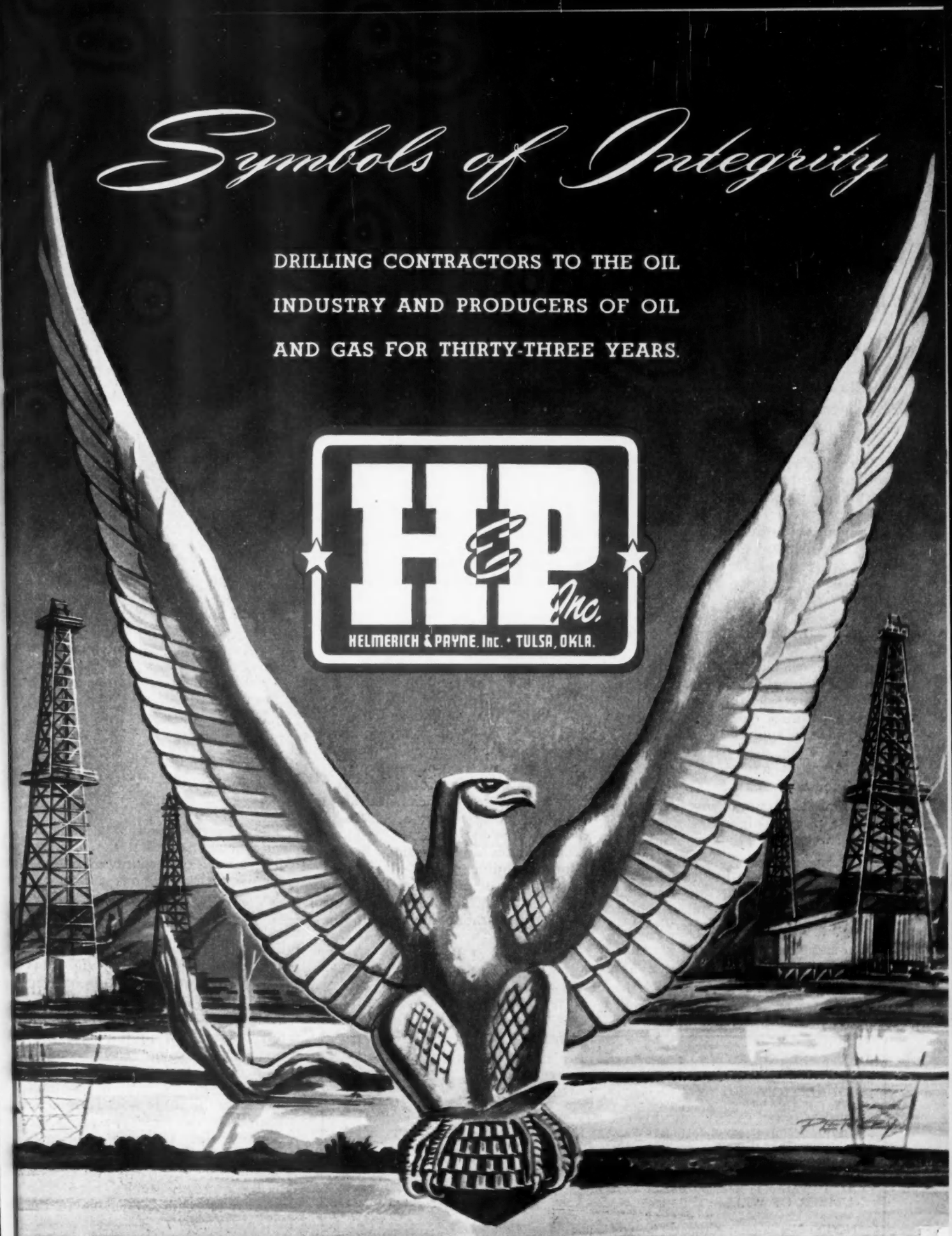
Comparison of II and III

	A.	B.	Difference
Total Deductions (above)	$400,000.00	479,200.00	79,200.00
Less 27½ Percent of Excess of Income in B Over A to Bring to Comparative Basis			34,650.00
Net Additional Deductions (comparative basis)			$44.550.00
Tax Saving at 50 Percent			$22,275.00

TABLE 4

Percentage depletion calculation.

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TULSA, OKLAHOMA

How to Present Property Appraisal Data

Here's an outline for the operator in assembling information needed for securing a loan or sale or exchange of assets.

By R. I. BRADLEY, Senior Engineer
Keplinger and Wanenmacher, Petroleum Engineers, Tulsa

MOST OF THE major financing institutions of the country require certain pertinent data pertaining to producing oil or gas properties when these assets are submitted to them as security for a loan. These data are sometimes submitted directly to the lending institution for analysis by their oil loan department, but there are many instances when these departments are unable to assume the burden of investigating and evaluating a large number of widely distributed properties. Consequently, it is often necessary for the party desiring the loan to employ a firm of consulting engineers to prepare an appraisal of the properties, based on these data, which is then turned over to the lending institution for their analysis.

Appraisals of producing properties are also prepared for one or both of the parties involved in a contemplated sale or exchange of assets. The information used in preparing these reports is either supplied to the appraisal *engineer* by the parties concerned, or are obtained by him from their files.

The basic data required by the staff of a lending institution or the appraisal engineer are essentially the same. However, it is very seldom that any attempt is made to assemble them in advance of their need, regardless of any prior knowledge by an owner that a sale or loan is contemplated. A little foresight on the part of a person needing an oil loan or an appraisal will save him on the overall cost of the transaction and will reduce the time and effort expended by all the parties concerned.

Therefore, it is considered appropriate to present an outline of the data customarily required by an engineer in the preparation of an appraisal of oil and gas properties. It is believed that this outline, supplemented with ideas as to the form of presentation and reasons for their need, will materially assist anyone in proceeding with the assembly of this information prior to approaching a financial institution for a loan or employing a consultant to prepare an appraisal.

These data are classified, in the following outline, not as to any particular order of procedure, but as to the order in which they apply to the form of preparation included in the discussion.

Description of Lease: The following information should be prepared for each lease:

1. Description.
2. Size of the lease in gross acres.
3. Working interest owned, or the portion of the working interest to be considered, expressed as a percentage of the whole.
4. Portion of gross oil sales applicable to interest, as a decimal.
5. Operator of the property.
6. Royalty and overriding royalty applicable to the entire property.
7. Oil payment applicable to the property, original amount of the payment in dollars, factor applicable, and balance of the amount remaining.
8. Number of wells.

NAME: John Brown.
FIELD: Salina. COUNTY: Saline. STATE: Kansas.
DESCRIPTION: W/2 SE/4 Section 18, T. 14S, R. 2W.
SIZE OF LEASE: 80 Acres.
WORKING INTEREST OWNED OR TO BE APPRAISED: 50%.
PORTION OF GROSS OIL RECEIVED BY APPRAISED INTEREST: 0.3828125*.
OPERATED BY: X — Y — Z Oil Company.
ROYALTY: ⅛. OVERRIDING ROYALTY: 1/16 of ⅞*.
OIL PAYMENT: $10,000 out of 1/16 of ⅞; balance $4350*.
NUMBER OF WELLS: Oil—4 GAS—None SHUT DOWN—1 SWD: 1.

*NOTE: Net interest corrected for portion of oil applicable to oil payment.

FIGURE 1

Figure 1 shows a form which may be adopted for presenting these data for each lease. However, where there are many leases, it may simplify matters to tabulate these data in columns.

The description should be sufficiently detailed so that the property can be located on a county map, especially if the descriptions are in the ordinary sections, townships or ranges. Leases in Texas, or in locales where the description is confusing because of other methods of description, may be described in a general way and plats submitted to show the outlines of the leases.

It is important that the proper interest be reflected in the data submitted to avoid future misunderstandings between the interested parties. Sometimes, in the case of contemplated sales the entire working interest is appraised; especially if there is the possibility that the various owners may later pool their working interests. It is often helpful to have an expression showing the decimal portion of the gross oil sales applicable to the interest appraised.

Complicated sliding scale royalties and overriding royalties should be carefully explained. It is usually less

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There's one basic reason, above all others, why the experienced producer chooses AJAX: to get his wells pumped at the lowest *overall* cost for power.

That reason takes in everything AJAX has to give. That's why AJAX Engines *lead* wherever long-term cost requirements are most demanding. *Ask your Supply Man.*

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CORRY, PENNSYLVANIA

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confusing to show the overriding royalty applicable to the entire working interest, rather than the portion applicable to the working interest appraised. The same is true for oil payments against the lease.

The number of wells should be classified as to oil producers, gas producers, temporarily abandoned wells or wells shut down and salt water disposal wells.

Record of Past Oil Sales: The past sales of oil or dry gas, in gross barrels or thousands of cubic feet, respectively, should be tabulated for each lease. This record should be prepared to show the sales by years since inception or date of acquisition of the lease. The sales during the last two calendar years should be given by months. The corrected pipe line runs for the most recent month is not always available, and runs which are calculated from field gauge tickets are sometimes substituted, if properly indicated as such. A record of the accumulated production since the date of inception of the lease should be given, if available.

The record of past gross income from the combined sales of casinghead gas and plant products should also be tabulated by years for each lease having income from this source. This record is needed to account for the revenue from this source, which is usually converted to an income per gross barrel of oil basis for use in the appraisal.

Company's or Operator's Share of Income: The company's or operator's net share of income, exclusive of gross production taxes, should be furnished.

The data should be given for the months available during the most recent two calendar years. These data are used in conjunction with net operating expense to derive the operating profit, and is also desired by many of the financial institutions in their analysis of the properties.

Record of Past Operating Expense: The past operating expense of each lease should be tabulated by months for the months of operation during the most recent two calendar years. It is generally more feasible for an operator to furnish his net share of the operating expense in lieu of the total or gross operating expense for the lease. It is important to make proper notations if the applicable interest represented by the operator's net share has changed during the period of the record.

It is the prime purpose of these data to determine the normal and reasonable operating expense attributable to each lease. Therefore, items of non-recurring expense, such as reconditioning and recompletion of wells, should be excluded or should be noted in some appropriate manner. It is very helpful to have a tabulation which shows a year of operating expense by months for each lease, classified by items of expense. The operating expenses which are furnished should not include production tax assessed by the state, nor should they include items which are charged to general office overhead, depreciation, or depletion. General office overhead expense is usually accounted for in a separate portion, or is sometimes completely omitted from the appraisal. It is always helpful to include a list of the items included in the figures furnished for operating expense if a tabulation by items is not given. Salt water disposal income may be applied as a credit to operating expense, and a notation should be made when this is applicable to any lease. Trucking expense for transporting oil to a pipe line facility may be included in operating expense, provided that the situation is temporary and a suitable note is made to call attention to this fact. Otherwise, it is customary in most appraisals to deduct the trucking cost from the crude oil price.

Production and Operating Expense Record: Figure 2 shows a form which may be adopted for presenting a

PRODUCTION AND OPERATING EXPENSE RECORD

Lease:_____ Net Interest:_____ (C)

Period	Production (Bbls.) Gross	Production (Bbls.) Net	Company's Share of Income (A)	Net Operating Expense (B)	Operating Profit Or Loss
Prior to 19					
19					
19					
19					
19					
19					
19					
19					
19					
19 Jan.					
Feb.					
Mar.					
Apr.					
May					
June					
July					
Aug.					
Sep.					
Oct.					
Nov.					
Dec.					
Year Total					
19 Jan.					
Feb.					
Mar.					
Apr.					
May					
June					
July					
Aug.					
Sep.					
Oct.					
Nov.					
Dec.					
____ Mo's Or Year Total					
Total To Date					

REMARKS:

(A) Excludes Production Tax. (B) Excludes Production Tax, Depreciation, & Depletion.
(C) Your portion of Working Interest less Royalty & Overriding Royalty, but not less Oil Payment Interest.

FIGURE 2

record of production (or pipe line sales), net income and net operating expense. It also contains a provision for calculating the operating profit or loss.

Price Schedule: A tabulation should be prepared which shows the following: Present price of the crude oil or dry gas, including gross production tax and a note whether there is any "call" on the oil. If the oil is being trucked to the pipe line, and there is no immediate change anticipated in this necessary item of expense, the trucking cost per barrel oil should also be indicated on this schedule. If condensate is being sold from a lease which produces dry gas, this fact should be noted on the schedule of the crude price.

Lease Plats: Plats should be furnished which show the accurate location and well number of the wells on each lease. These plats should also show the location of the offset producing wells, also the geologic structure, contoured on the principal producing horizon if these data are available. The dry holes and salt water disposal wells should also be indicated.

Individual Well Completion Data: It is not always easy to furnish sufficient data on the producing wells in a form suitable to the demands of every appraisal engineer. However, the purpose of these data in an appraisal is to show the present status of the producing wells and to indicate shows or other evidence upon which the undrilled, or proven non-producing reserves may be predicated. Therefore, it is generally more feasible to submit copies of any of the following records:

1. Well logs filed by the company with the state agency.
2. Company well completion records.
3. Electric or radioactive logs run in the wells.
4. Geologic reports submitted by the geologist on the well.
5. Core analysis reports of producing or prospective producing zones.
6. Reservoir fluid analysis reports.

The data submitted should contain enough information so that the following facts may be presented in the valuation report:

1. Elevation of the well (derrick floor or rotary bushing).
2. Location of the well in the section.
3. Original date of completion, original potential or initial production (oil and water) and manner of production.
4. Recompletion data, including date recompletion was commenced and completed, production before and after recompletion, and manner of taking test.
5. Producing horizons on original completion and recompletion, including geologic top, interval perforated, and thickness of pay.
6. Record of amount of oil string in the well and depth at which set, including liners used in the completion.
7. Total depth, plugged back depths and manner of plugging back.
8. Acid or hydrafrac treatments and shooting record, including the amounts and intervals affected.
9. Drill stem tests, or other production test made during the drilling or completion which may indicate the potentiality of zones cased or plugged off in the wells.
10. Present daily production of oil and water for each well.

Figure 3 is a form which may be used for presenting these data, but it should be realized that most engineers desire to develop their own tabulation from the basic records supplied by the operator.

Additional data should be supplied for the appraisal of gas wells. These consist of the following:

1. Original shut-in pressures or shut-in bottom hole pressure tests.
2. Original open flow potentials.
3. Record of subsequent measurements of open flow potentials and shut-in or bottom hole pressure measurements.
4. Line pressure of purchaser.
5. Gravity of gas.
6. Pressure base for measurement of gas as stated in the purchase contract.

General Lease Data: Data included

About the Author

R. I. BRADLEY was graduated from the University of California in 1933 with a B.S. degree in petroleum engineering. He was employed by Gypsy Oil Company, now Gulf Oil Corporation of Tulsa, as an engineer trainee and then promoted to junior engineer. From 1937 to 1942 he was employed by H. F. Wilcox Oil and Gas Company as a production engineer. He entered the service in 1942 and was commissioned a lieutenant in the U. S. Navy. He served in a department of the Army-Navy Petroleum Board and was released in 1945. Bradley spent approximately six months with Grimes Gasoline Company after his release from the navy and has been in the employ of Keplinger and Wanenmacher, Tulsa, since 1946.

INDIVIDUAL WELL DATA

Lease:					
Well No.:					
Location in Section:					
Elevation:					
Completion Date:					
Initial Production:					
Producing Zone:					
Name					
Interval					
Top (Subsea)					
Thickness					
Oil String:					
Total Depth:					
Acid or Shot:					
Amount					
Interval					

FIGURE 3

in this category consists of the following:

1. Present producing method of wells and hours produced.
2. Potential, daily allowable, if prorated, daily production of oil and water and gas-oil ratio of wells.
3. General lease equipment, by items.
4. Purchaser of oil or gas.
5. Source of fuel for the lease.

The daily average production of wells should reflect their capacity if they are not prorated. The daily average rate of production being used to obtain the allowable production should be indicated for prorated wells. These data should be based on the individual well tests, if available; or estimates of individual well production should be made by the superintendent or foreman and indicated as such.

Figure 4 is a form which can be used for the presentation of the general lease data.

It should be realized that it is not possible to present an outline of the data needed in an appraisal in a manner comprehensive enough to include all the variables in the properties encountered in the field of oil and gas property valuations. The outline presented in this discussion will serve as a guide to an operator who desires to be prepared for an appraisal engineer thereby speeding up the process and saving him on the cost of a necessary step in a financial transaction.

NAME OF LEASE _____ AREA _____ STATE _____

WELL REPORT AS OF 7:00 A.M. _____ 19____

ACCOUNT FOR EACH WELL DRILLED ON THE LEASE

	MARK X IN PROPER SQUARE											WELL DATA							
	WELL STATUS					PRODUCING METHOD													
WELL NUMBER	OIL WELL	GAS WELL	GAS CONDENSATE	WATER DISPOSAL	DRY HOLE ABANDONED	FLOWING	PUMPING INDIVIDUAL UNIT	PUMPING GAS LIFT OR OTHER	NUMBER OF HOURS PUMPED DAILY	SHUT DOWN OR GAS IN REMARKS	POTENTIAL (LAST OFFICIAL)	DAILY ALLOWANCE (IF PRORATED)	DAILY AVERAGE PRODUCTION OIL (BBLS.)	DAILY AVERAGE PRODUCTION WATER (BBLS.)	DAILY AVERAGE PRODUCTION GAS (MCF.)	GAS OIL RATIO	% WATER	PRODUCING FORMATION
1																		
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		
16																		

TOTALS: DAILY ALLOWABLE _____ DAILY AVERAGE PRODUCTION: OIL _____ GAS _____ WATER _____

REMARKS: _____

LEASE EQUIPMENT:

TANKS _____

PUMPING UNITS _____

POWERS _____

DERRICKS _____

HEATERS _____

BUILDINGS _____

OTHER _____

LEASE DATA:

PURCHASER—OIL _____

—GAS _____

SOURCE OF LEASE

FUEL _____

ELECTRICITY _____

WATER _____

POWER OR FUEL FURNISHED OTHER LEASES OR COMPANIES _____

DATE _____ SIGNED _____

SUPT. OR FOREMAN

FIGURE 4

Save on Taxes

■ CONTINUED FROM PAGE 66

to a heavy drilling program but will have sufficient income next year, due to increased income from this year's drilling, to put him in a tax bracket of at least 50 percent. By paying the $500 rental and surrendering the lease the next year, the taxpayer will save $4500—assuming his net operating loss carryover would be nil after making necessary statutory adjustments.

Why is this true? Because nonproducing lease costs are deductible only in the year in which you abandon all of your interest in the lease. If you surrender the lease this year, the loss is all your money because you have no net taxable income. If you surrender it next year, you save $5000 in taxes (at 50 percent rate) less the $500 rental you paid on the last rental date (which might otherwise have been considered a waste of money).

Add to this, the situation where the prospects on a nonproducing lease are good on the rental date but subsequent development proves before the tax year ends that the leases are worthless. If your tax bracket this year is materially higher than can reasonably be expected next year, you can avail yourself of the charge-off this year by completely abandoning your interest to your lessor. This should be accomplished by a written instrument which should be recorded on the county records before your tax year ends.

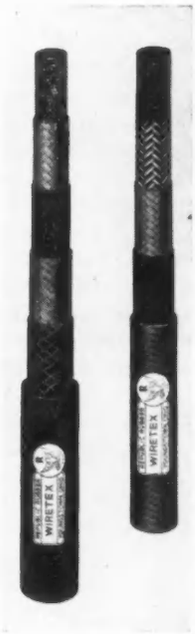
About the Author

H. O. REYBURN, partner in the firm of Nicholson, Reyburn and Company, Certified Public Accountants, Tulsa, Okla., specializes in tax problems pertaining to the oil industry. He was graduated from the Oklahoma School of Accounting in 1939 with a B.C.S. degree and became a C.P.A. the same year. In 1944 he became a partner in the firm of Nicholson, Reyburn and Traweek until the firm was dissolved in 1948 and the present firm established. He is vice president of the Tulsa chapter, National Association of Cost Accountants.

New Equipment

Supplementing Composite Catalog

High Pressure Hose



Republic Rubber Division of Lee Rubber & Tire Corporation is producing a special type of flexible, high pressure industrial rubber hose called Republic Wiretex. Wiretex hose is made with a mandrel cured, Reprene tube in lengths up to and including 60 feet. The tube is reinforced with a specially selected textile carcass which is continuously braided around the tube in multiple rubber-impregnated plies, or with alternating plies of braided fabrics and braided plies of wire, or with multiple braids of standard or extra heavy wire only. The hose carcasses are encased in either abrasion resistant, thick rubber covers or covers made of braided textiles.

This item supplements Lee Rubber & Tire Corporation data on pages 4392-4393 of Composite Catalog, 18th Edition.

Circle No. 13 on Postcard

Spiral Pipe Reamer

A new Ridgid Spiral 2-S pipe reamer has been added to the pipe tools made by The Ridge Tool Company. The manufacturer claims this new spiral reamer cuts inside burr from pipe and conduit clean and fast with minimum effort or pressure. Use of high quality tool-steel in construction assures long tool life. The reamer cuts holes in sheet metal also. Reamer capacity is from ⅛- to 2-inches.

This item supplements The Ridge Tool Company data on pages 4400-4404 of Composite Catalog, 18th Edition.

Circle No. 14 on Postcard

Ratchet-Lever Hoist

The new model "R" coil-chain ratchet-lever hoist made by Coffing Hoist Company introduces many new

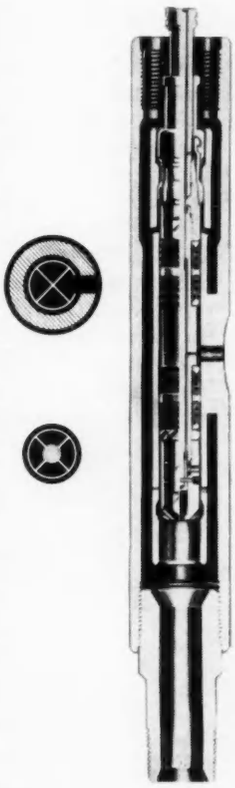
conveniences and safety features. Retaining the unique ratchet and pawl operating principle originated by Coffing, and substituting the coil for the roller chain for easy swing or wrap in any direction, model "R" may be pulled freely through the hoist head for quick adjustment when not under load. The handle operates in any position solving the problem of cramped working quarters. The handle also operates with either partial or full strokes. Safety stops prevent the handle from spinning.

This item supplements Coffing Hoist Company data on page 1269 of Composite Catalog, 18th Edition.

Circle No. 15 on Postcard

Choke Assembly

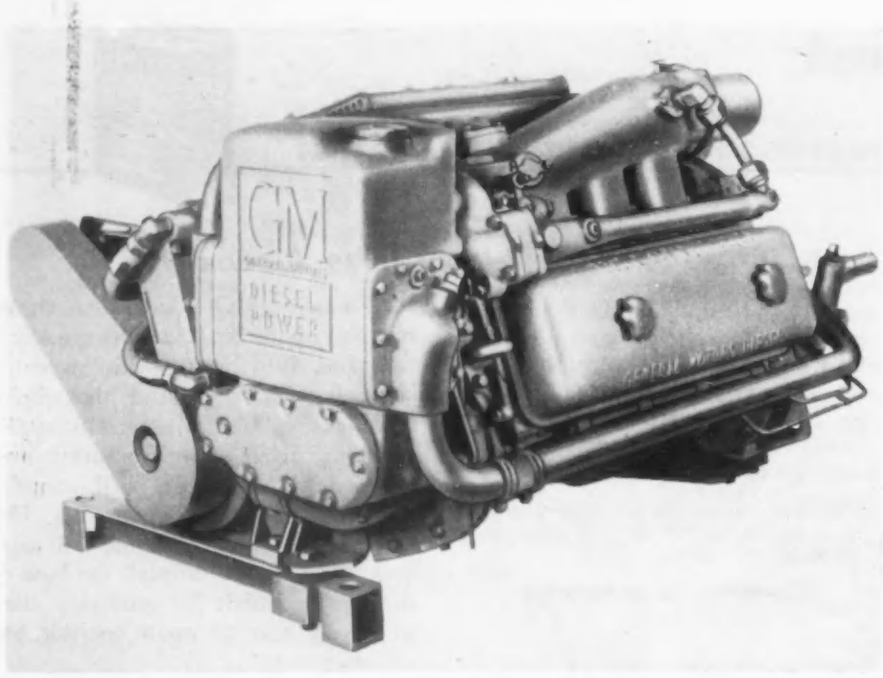
A new type Otis side-door choke assembly made by Otis Pressure Control, Inc. is designed with an extra large flow area around the choke landing nipple. It is especially applicable for formation-fracturing and other newly-developed well completion and production operations. The flow passage of conventional Otis side-door assemblies is through the bore of the choke which for ordinary two-zone wells is an adequate conduit, but which retards injections of gels and other media under extremely high pressure and in large volume. This new Type "A" assembly consists of a landing nipple mounted concentrically within an outer flow sleeve. A large bypass area around the seating nipple provides a flow course of more than two square inches for high-pressure and large-volume flow through the tubing. The new choke has a built-in equalizing device to facilitate pulling the tool in the event unbalanced or packed-off pressures prohibit full equalization across the choke. Because the seating nipple is made up within the flow sleeve, the same size choke can be run in either a 2- or 2½-inch string.



This item supplements Otis Pressure Control, Inc., data on pages 3969-4004 of Composite Catalog, 18th Edition.

Circle No. 16 on Postcard

Save time! Keep informed! Circle numbers on postcard, page 75

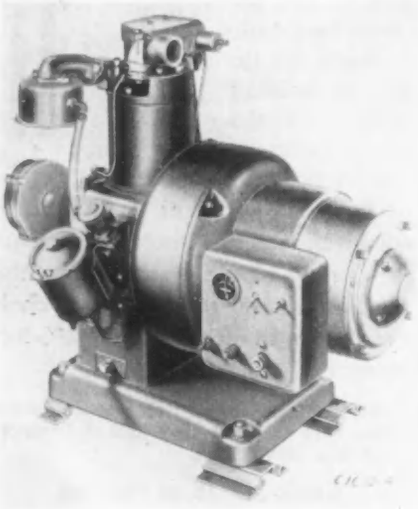


Diesel Products

This month General Motors, through its Detroit Diesel Engine Division, will announce three diesel products of interest to both off-shore and inland drillers. Two products are marine diesel engines Series "51" and "71" which feature compact size and low weight-to-horsepower ratio. The third product is a permanent-magnet type diesel-electric set which requires no attention or maintenance other than normal servicing of the engine. The engine shown is an adaptation of the "71" series of four-cylinder engine. The engine height has been reduced 9½ inches from the conventional model by tilting the head and block 70 degrees from vertical. Its weight has been reduced 500 pounds through extensive use of aluminum. The height of the engine from the centerline of the output shaft is 24⅞ inches with over-all width 37½ inches. It has three point suspension with each contact point cushioned in rubber. The permanent magnet generator set has a capacity of 12½ kilowatts. It is driven by a two-cylinder model of the new "51" series engine and the weight of the generator itself is 40 percent less than conventional units of the same capacity. Total weight is 1200 pounds. It has an over-all length of 37⅜ inches.

This item supplements Detroit Diesel Engine Division, General Motors Corporation, data on pages 1418-1423 in Composite Catalog, 18th Edition.

Circle No. 17 on Postcard



Marine Diesel Plant

Two new marine diesel electric generating plants will be introduced by D. W. Onan & Sons Inc., in 1953. Both water-cooled, they are the 3000-watt, single-cylinder model 3MDSP-232E with 32-volt output for charging storage batteries; and the 5000-watt, two-cylinder model 5MDRP-1R which produces 115-volt, 60-cycle alternating current. The 3000-watt model is electrically cranked with the generator acting as the cranking motor. It is equipped with a decompression device for quick, easy starting. The engines are Onan 4-cycle diesels equipped with rubber impeller marine water pumps.

This item supplements D. W. Onan & Sons Inc. data on pages 3966-3967 of Composite Catalog, 18th Edition.

Circle No. 18 on Postcard

Hardfacing Process

A new hardfacing process using the standard Automatic Heliweld Head and a unit for feeding bulk tungsten carbide has been announced by Air Reduction Company, Inc. This equipment was designed especially for depositing tungsten carbide hardfacing material on tool joints for well drilling rigs. Its flexibility seems limited only by the ability to position the work and the arc in the proper relationship to each other. The manner of deposition of loose, granular pure tungsten carbide particles minimizes reduction of particle size by solution of the tungsten carbide into the base metal. It also minimizes the heat-affected area adjacent to the deposit.

This item supplements Air Reduction Company, Inc., data on page 159 of Composite Catalog, 18th Edition.

Circle No. 19 on Postcard

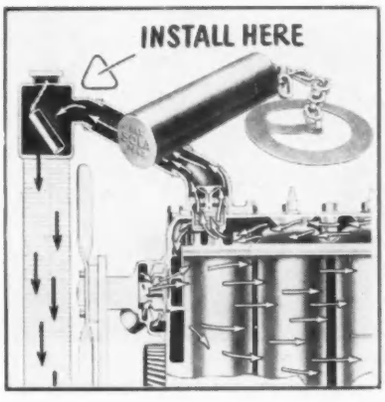
Save time! Keep informed! Circle numbers on postcard, page 75

Other New Equipment

Ground Clamp

Tweco Products Company has announced a new "Cub" ground clamp which has a rated capacity of 200 amperes. The "Cub" features a protruding upper lip for extra leverage in applying the clamp, wide jaws for added conductivity, serrated lower jaw which removes rust and scale as the clamp is applied and assures a clean connection, a strong and fully insulated spring, and simple bolt and clamp connection. This ground clamp makes it possible to shift ground connection easily and quickly to reduce "arc blow" and shorten the welding circuit for current economies.

Circle No. 20 on Postcard



Catalytic Rust Reducer

Sola Auto Cell, a catalytic cell which removes scale and reduces rust in the cooling system of any water-cooled automotive or stationary engine has been announced by Hales-Mullaly Company. The cell sets up a molecular magnetic action which disperses the elements of the water having an affinity for forming scale, rust and corrosion. The cell is simply placed in the radiator, and does not require involved installation.

Circle No. 21 on Postcard

Impedance Bridge

The Universal impedance bridge and companion bridge oscillator-amplifier manufactured by Brown Electro-Measurement Corporation are described in a new bulletin. Accuracy specifications for the bridge are: resistance, 0.10 percent; capacitance, 0.25 percent; inductance, one percent. Measurements can be made over the following ranges: resistance, one milliohm to 11 megohms; capacitance, one microfarad to 1100 microfarads; inductance, one microhenry to 1100 microhenrys; storage factor of inductors (Q) 0.02 to 1000; dissipation factor of capacitors (D) 0.001 to 1.0. The oscillator-amplifier which fits into the battery compartment of the bridge converts the bridge to 115 volt ac operation and provides a highly stable oscillator, high-gain null amplifier with plug-in frequency selection, and a tuning eye for visual null indication.

Circle No. 22 on Postcard

Check Valve Ball

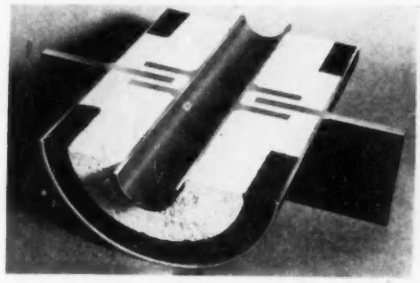
A new titanium-carbide ball manufactured by Kennametal Inc., is one-third lighter than steel, and is about one-half lighter than tungsten-carbide balls for check valves. Its wear characteristics are greater than that of steel and about the same as regular tungsten-carbide. The new ball has a specific gravity of 6.15 compared with a specific gravity of about 12 for cemented tungsten-carbide.

Circle No. 23 on Postcard

Micro-Talkie Transmitter

Production of a hand-sized Handie Micro-Talkie transmitter designed to operate in the 152-174 millicycle frequency band is announced by Motorola. Weighing less than two pounds, the unit has a power output of 20 to 40 milliwatts and a tested optimum range up to five miles. The transmitter, with self-contained dry batteries and microphone, is contained in a sturdy, seam-welded housing finished with gray automotive type baked enamel. A rigid, chrome-plated-loop antenna doubles as the carrying handle. The tiny transmitter uses eight subminiature tube stages with "printed" associated circuitry.

Circle No. 24 on Postcard



Pipe Anchor

Durant Insulated Pipe Company offers a new type of insulated anchor for use in underground insulated pipe systems conveying hot or cold liquids or gases. The anchor is so constructed that contact is eliminated between anchor plate and pipe. The plate is insulated from the pipeline both thermally and electrically by a non-compressible block of Transite sheet material. The design and material serve to minimize heat loss at anchorage points and prevent pipeline corrosion due to electrolytic action.

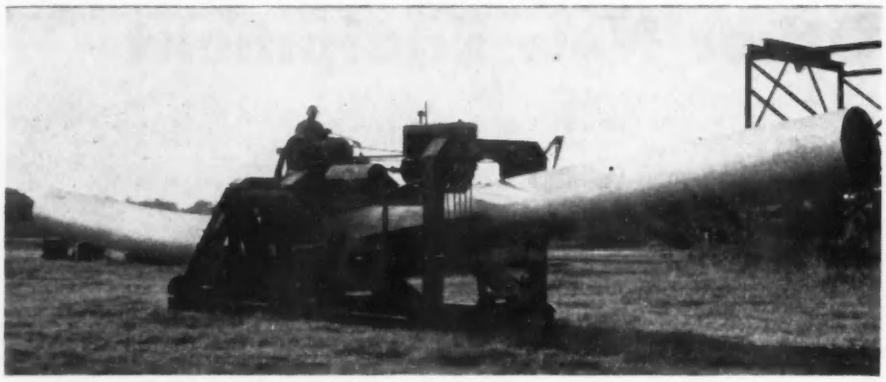
Circle No. 25 on Postcard

Save time! Keep informed! Circle numbers on postcard, page 75

Protective Coating

Flexcoat, maintenance coating, made by Flexrock Company, was developed to give protection against corrosion caused by atmospheric conditions, vapors, fumes, spillage and chemical splash. Flexcoat protects against corrosion by acids and alkalis and can be brushed, sprayed or dipped, or applied over old paint. It is made in a wide range of colors to decorate and identify machines and pipe lines. A plastic resin finish, it contains no oxidizing oils or resins.

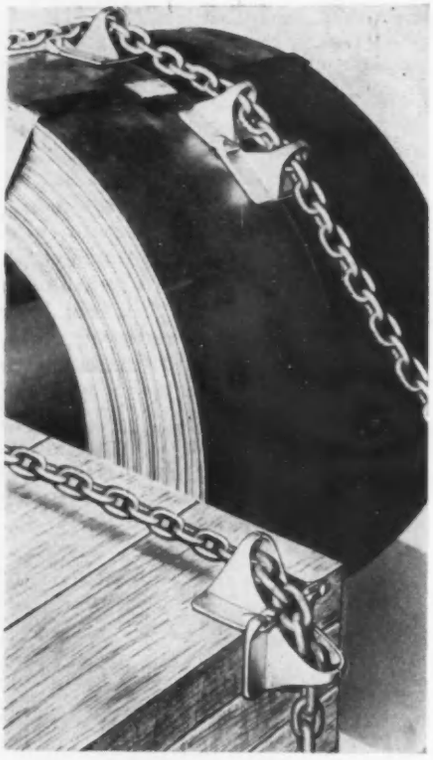
Circle No. 26 on Postcard



Pipe Bending Machine

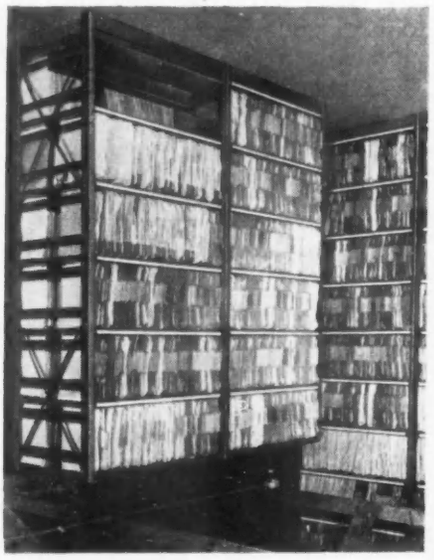
Crutcher-Rolfs-Cummings, Inc., in cooperation with Transcontinental Gas Pipe Line Company has built a 36-inch smooth pipe bending machine. The machine is portable, track mounted, and weighs 33,000 pounds. The over-all length is 24½ feet, with a width of 92 inches. In recent tests the machine smooth bent cold pipe one-half degree per foot. The test pipe had wall thickness of 0.393 inch and a nominal yield strength of 52,000 psi. In vertical bending the degree of bend may be measured with a level or bubble-type protractor. The machine does not require an experienced operator and requires only a small crew. The new machine is similar in design to smaller pipe benders built by C-R-C.

Circle No. 28 on Postcard



Sealing Rings

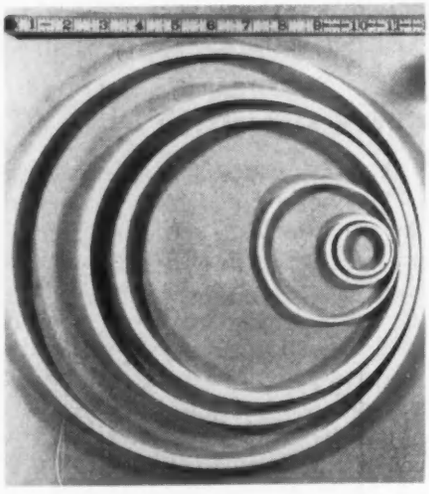
Production of three new series of rings for special sealing applications where elastomeric O-Ring compounds are unsatisfactory has been announced by W. S. Shamban & Company. The new Shamban synthetic O-Rings are claimed heat resistant, chemically inert, and possess low coefficient of friction. Kelon-F and Kelon-T O-Rings are unaffected by oils, acids, bases or solvents. Temperature range for Kelon-T is from minus 110° F. to plus 500° F. The range for Kelon-F runs to 425° F. Nylon and Poly-ethylene O-Rings are the third part of the three part series. Design information is available.



Load Protectors

New metal Hinge-Guard load protectors made by Canton Manufacturing Company prevents pipe, tubing, and similar loads from shifting. Chain or cable contact with the load is eliminated and increased chain tension makes the load more compact. The hinge-guard is two pieces locked together to make a unit which will angle from 90 to 180 degrees. The Hinge-Guards can be used singly by lifting the two pieces apart. They accommodate chain or cable up to and including ½-inch and if grab-hook is already secured to chain, it will thread through the unit.

Circle No. 27 on Postcard



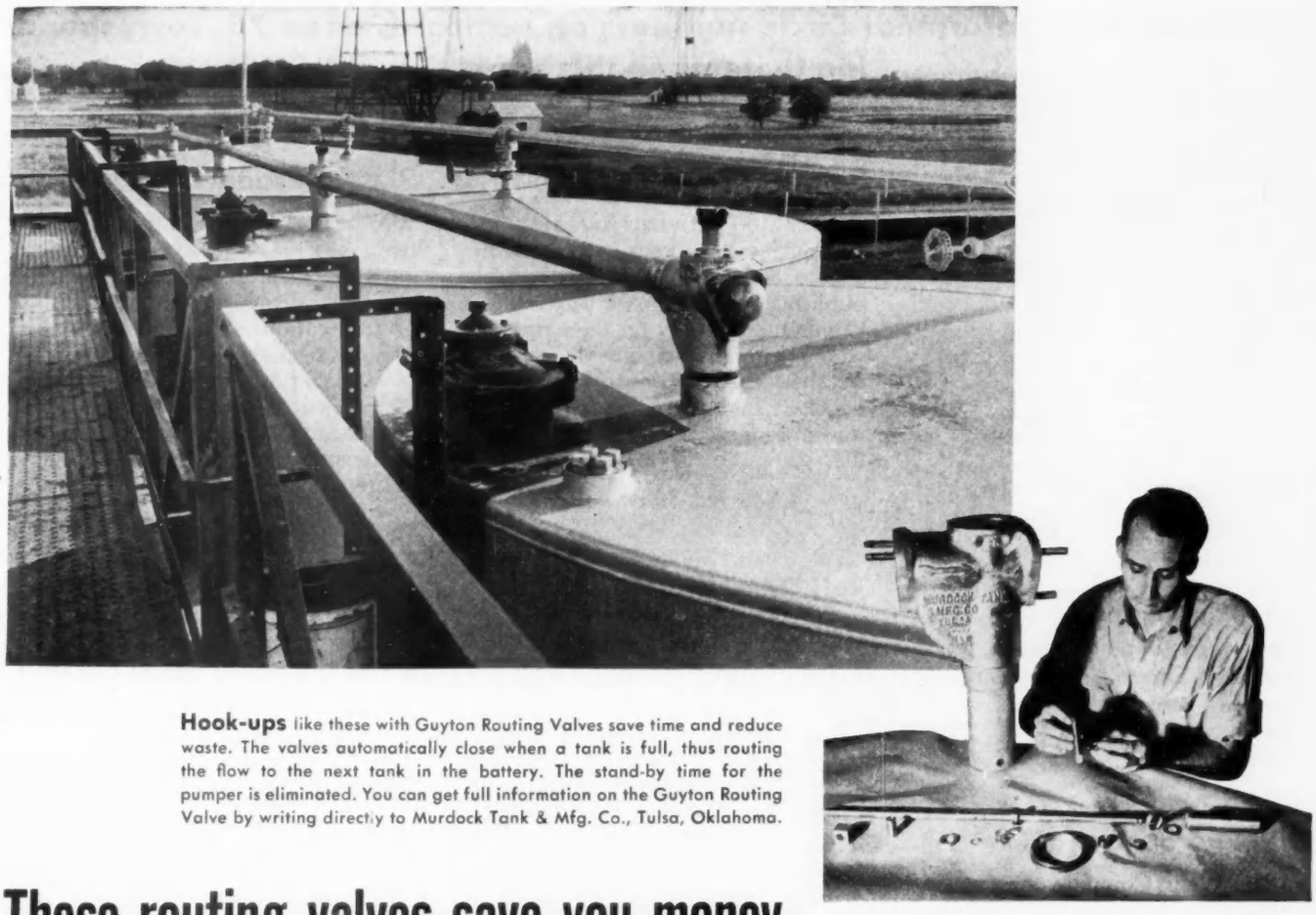
Circle No. 29 on Postcard

Record Cabinet

Equipto, a division of Aurora Equipment Company, has available a new accessible space saving steel storage for the purpose of filing old records. Extremely compact, the shelves permit use of "sky room" area, making maximum use of storage locations. Old records, usually kept for a period of five years and taking up five times the space of current records, make a minimum space arrangement essential. Label holders on the shelves permit instant location of stored files.

Circle No. 30 on Postcard

Save time! Keep informed! Circle numbers on postcard, page 75



Hook-ups like these with Guyton Routing Valves save time and reduce waste. The valves automatically close when a tank is full, thus routing the flow to the next tank in the battery. The stand-by time for the pumper is eliminated. You can get full information on the Guyton Routing Valve by writing directly to Murdock Tank & Mfg. Co., Tulsa, Oklahoma.

These routing valves save you money ...on stock tank hook-ups

With Guyton Routing Valves you can save the unnecessary time and expensive car mileage normally involved in manually operating tank batteries on widely scattered leases.

Once the valves are set on the battery of tanks, the Guyton Valve automatically controls the flow of the oil from the well to the storage tanks. As each tank is filled, the valve closes and the oil is routed to the next tank.

When the last tank is filled the line is automatically closed. The only manual attention required is the resetting of the valves. Any tank can be by-passed by simply not setting the valve on that tank.

In addition to the savings in time and mileage, the Guyton Valve reduces waste and eliminates the fire hazard of overflowing tanks.

Monel used to meet severe conditions – The manufacturers of the Guyton Valve wanted a metal that would stand up against the destructive attacks of hydrogen sulfide, brine and entrained solids.

That's why they chose Monel for the working parts – for stems, valve seats, springs, washer bushings, and float assembly blocks and float arms. Monel offers protection against the severest oil field conditions because it combines high strength and toughness with an exceptional degree of resistance to corrosion, abrasion and wear.

Consult your distributor of Inco Nickel Alloys for the latest information on their availability from warehouse and mill. Remember, too – it always helps to anticipate your requirements well in advance.

And any time you run into problems involving metals for oil field use, we hope you'll write us. Inco's Technical Service and Corrosive Engineering Section may already have the answer handy. If not, they may be able to help you find it. Either way, there's no charge or obligation.

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Save time! Keep informed! Circle numbers on postcard, page 75, corresponding to items on this page.

Pipe and Casing

A new catalog by Southern Pipe & Casing Company contains information on the steps of pipe making as well as the latest procedures in the applications of various protective coatings.

Circle No. 31 on Postcard

Telephone Type Relays

Automatic Electric Company has described its complete line of telephone-type relays, including hermetically sealed sub-miniature, plug-in types, in a new color brochure. The relays are sealed in metal and glass containers.

Circle No. 32 on Postcard

Oil Field Service

Lane-Wells Company has issued a catalog covering services and technical products offered to the oil industry. This revision summarizes the latest information on perforating, radioactivity well logging, packers, and bridging plugs.

Circle No. 33 on Postcard

Centrifugal Pumps

Marlow Pumps has released a new brochure covering their complete line of pumps. The brochure is a review and reference bulletin covering self-priming and straight centrifugal pumps as well as mud hog diaphragm pumps.

Circle No. 34 on Postcard

Automatic Free Piston

A new bulletin by Garrett Oil Tools, Inc., on automatic free pistons describes the design and construction of the tool and contains many illustrations of the manner in which the free piston is used to reduce gas fluid ratios, and to eliminate formation of paraffin, in both gas lift and flowing wells.

Circle No. 35 on Postcard

Safety Marking Tools

Over 100 different marking tools and devices are described in the new Mecco Safety Marking Tool catalog published by M. E. Cunningham Company. In addition the catalog includes information on Mecco safety steel, a specially developed alloy which is said to reduce spalling and mushrooming and increase marking life.

Circle No. 36 on Postcard

Self Priming Pumps

Rice Pump and Machine Company has released a bulletin with details and specifications of all models of their portable, self-priming centrifugal pumps. All models feature modern, light weight, four-cycle, air-cooled gasoline engine power. Sizes from 7M to 40M are also available with pulleys for belt drives and flexible couplings for direct-connected electric motor drives.

Circle No. 37 on Postcard

Air Check Valve

Pennsylvania Pump & Compressor Company offers literature on the new Airchek Valve which checks leakage of pressure through the compressor during the off cycle. Identical in design and construction with the company's Air Cushion valve, the Airchek valve cannot be assembled incorrectly as the dowel pin prevents such assembly. It can be installed vertically or horizontally.

Circle No. 38 on Postcard

Steel Castings

Facilities and methods employed by Lebanon Steel Foundry are contained in a booklet which also includes specific data on that company's special alloy, high quality carbon, and stainless steel castings. A reprint of an article on low temperature applications for austenitic cast stainless steels is included with the booklet. The author is John Juppenlatz, Lebanon's chief metallurgist.

Circle No. 39 on Postcard

Plastic Products

New York Belting & Packing Company has issued a booklet describing its "Indestructible" plastic which is available as pipe moldings, extrusions or fabrications. Toughness and high impact strength is claimed for this plastic without sacrifice to stiffness. The plastic is noncontaminating, odorless, tasteless, nondiscoloring, shatterproof, and has excellent chemical resistance.

Circle No. 40 on Postcard

Liquid Storage

A folder on considerations to be taken when planning liquid storage is offered by Concrete Storage Incorporated. The company uses a "sliding-form" technique for constructing concrete tank walls, a technique which practically eliminates construction joints. In contrast to steel construction which must be scraped and painted, concrete maintenance problems are low. The concrete structure can now be built even during cold weather.

Circle No. 41 on Postcard

Midget Packing Gland

Conax Corporation has published a leaflet describing the new Conax midget packing gland. This complete line of packing glands is of stainless steel and each is instantly adaptable for sealing the entry of thermometers, thermo-couple wells, pitot tubes, static pressure probes, round rods or tubes of any type, or even insulated electric lines.

Circle No. 42 on Postcard

Corrosion Preventive

Positive protection for iron and steel structures is claimed in a new bulletin released by Metallizing Engineering Company, Inc. Pure metallized zinc or aluminum protective coatings have proved a life expectancy of from 25 to 30 years according to the bulletin. Typical applications are described whose histories can be traced for the past 15 years.

Circle No. 43 on Postcard

Improved Magnetic Method Can Avoid Drilling Failures

Correct field procedure and interpretation will save money and indicate promising targets.

By MARK MILSTEIN
Consulting Geophysicist, Dallas

IT IS THE purpose of this article to demonstrate that by a proper use of the magnetic method, including correct field procedure and interpretation, numerous drilling failures can be avoided and more promising targets indicated. Developments in Sutton County, West Texas, will be used to illustrate this point. It might seem presumptuous to claim advantages in the neglected and frequently misused magnetic method. Yet it is to be hoped that this new observational procedure and interpretative technique might bring magnetics to the fore.

A reconnaissance magnetic survey of Sutton County was made in 1948, before any extensive drilling had taken place and without benefit of any subsurface knowledge or other supporting evidence. It will be apparent from an examination of the maps herewith that the majority of wells drilled in this county since 1948 had no possible chance for production.

Without going into the technicalities of this new approach, the magnetic map (Figure 1) is built up on the usual distribution of vertical magnetic intensities observed along the highways. It follows the common garden variety of magnetic work where the resulting isogram curves, so popular in some circles, are practically valueless. The curves, being physico-mathematical parameters not related to nor correlated with anything of geological nature, are a fiction. In this connection, it may be stated that any derivative of such a fiction remains also a fiction which must of necessity be misleading.

Thus, isograms as a geological implement remain of problematic value. On the whole the curves do not reflect, as claimed often by many authors, the effects of a basement or follow the configuration of the same. In fact, since they do not follow such configuration, the magnetic readings can be used for basement's interpretation only for very restricted portions of magnetic profiles.

By spacing the observation points sufficiently close and breaking the observed curves into uniform sections, as was done by the writer, and translated directly into lithological-structural terms (Figure 2), the sedimentary contrasts in various stratigraphic columns will stand out with sufficient clarity and will facilitate the differentiation of various lithological units. Thus the curves of vertical intensities could be analyzed step-by-step and correlated with the stratigraphic and structural pattern of an examined area, even if no other pertinent data is available. The popular misconception that there is not enough of a magnetic response in a sedimentary column, i.e., that in the majority of sediments the magnetic susceptibilities are small or even negligible, seems to be untenable. Experience has proved the absolute values of susceptibilities are of no importance. What counts is the magnetic contrasts "in situ" between the adjacent or superposed beds; and nearly always, this difference is large enough to provide a reasonable basis for evaluation of subsurface conditions for, at least, a few geological horizons or areas.

In examining the separate sections of a magnetic traverse, the effects of sands, shales and limestones (including dolomites or "reef" limestones) in the stratigraphic column may be discerned, and the depths to various physical discontinuities can easily be calculated. Proof of this great diagnostic value of the magnetic method is found in the second map (Figure 2) of Sutton County, in which the whole stratigraphic column, from the surface Cretaceous beds to the Ellenburger "datum" is qualitatively and quantitatively analyzed.

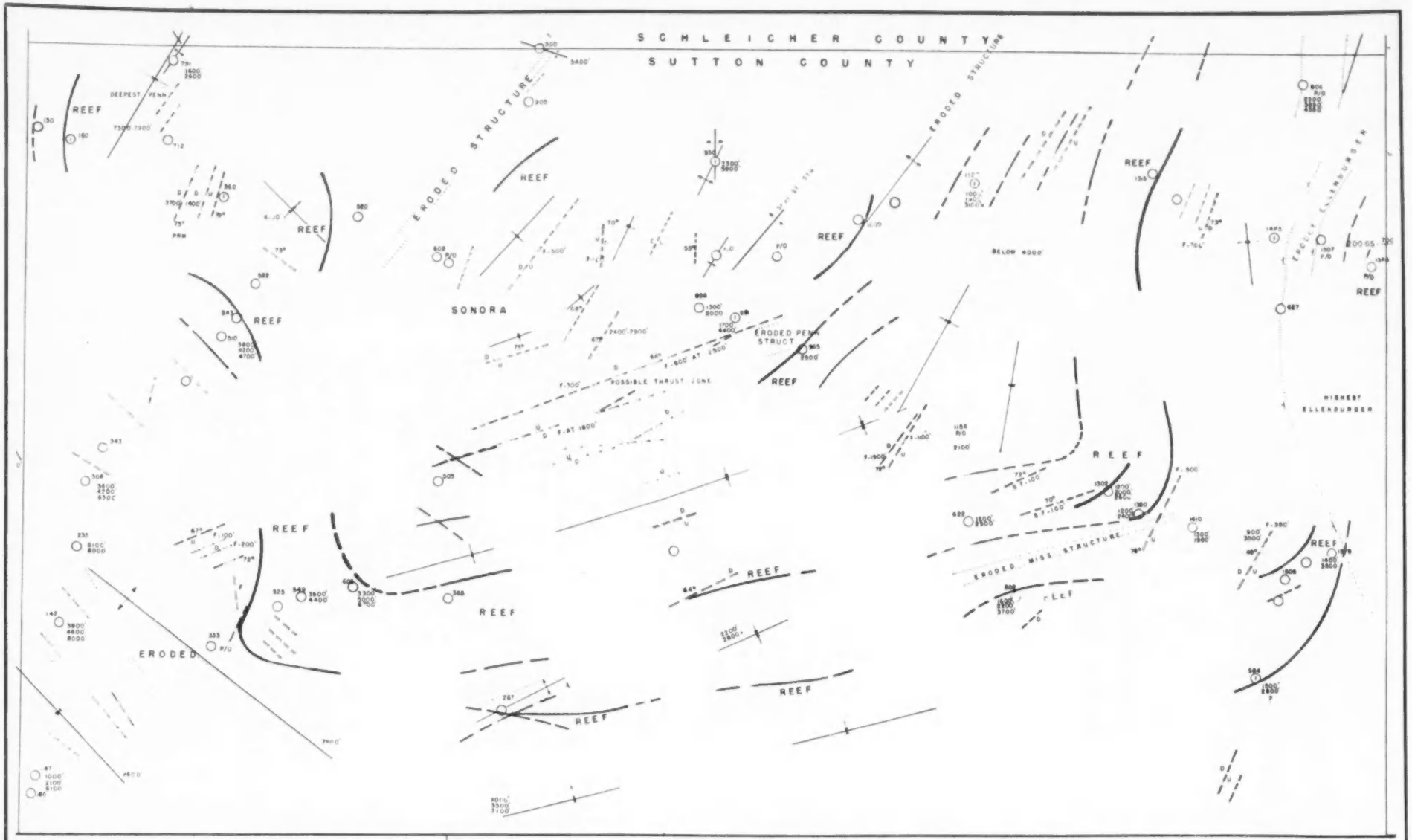
The dolomites and limestones of Cretaceous and Permian sediments, prevalent in the eastern part of the county, diminish rapidly in volume westward, though the beds themselves increase greatly in thickness. Sandy and shaly facies increase in the same way. West of the faults, described later, the Permian beds develop some abnormal thickness. The Pennsylvanian beds composed mainly of shales, follow an irregular pattern of sudden thickening (particularly in the central part of the county) and thin out on the westward trend. The outstanding lithological feature of this area is the ribbon-like development of "reef" limestones, as outlined on the map (Figure 2) with sharply distinctive facies constituting the fore-reef and the back-reef zones. Many of the observed reefs show the effects of far advanced erosive action.

Due probably to excessive stability of this region (except in the vertical sense) the sedimentary column suffers here from paucity of positive folding. Even the few observed folds, picked up by the survey at considerable depth (5000-7000 feet) fade out under the influence of truncation, observed on all important horizons (discontinuties). For the same reasons, the unconformities (discontinuties) between Cretaceous and Permian or between Permian and Pennsylvanian series stand out sharply.

The surface Cretaceous beds give no indication of any deformations other than faulting. The subjacent truncated Permian sediments show strong faulting effects with a few remaining pinchout closures. The Pennsylvanian beds, short on limestones, develop numerous basin-like depressions of variable trends. The axes of such basins are plotted on the map (Figure 2). The Mississippian and Ellenburger horizons show the truncated relics of the original structures.

The few surface faults of 100-150 feet displacement shown on the map (S. F.) are of small importance. Of much greater significance are the Permian, northeast trending, en-echelon, gravity-faults with the downthrow on the west. Such major faults, with a much greater throw and horizontal

(Maps on Pages 88-89)
▪ CONTINUED ON PAGE 94


SCHLEICHER COUNTY
SUTTON COUNTY
REEF
ERODED STRUCTURE
SONORA
ERODED PENN STRUCT.
POSSIBLE THRUST ZONE
ERODED MISS. STRUCTURE
BELOW 4000'
HIGHEST ELLENBURGER
LEGEND
BOUNDARIES
(MAGN. VALUES IN GAMMAS)
ANTICLINAL
SYNCLINAL
FAULTS
FOLDS
FAVORABLE TARGET AREA
3700' - DEPTH TO DISCONTINUITY
567 OBSERVATION POINT

the old

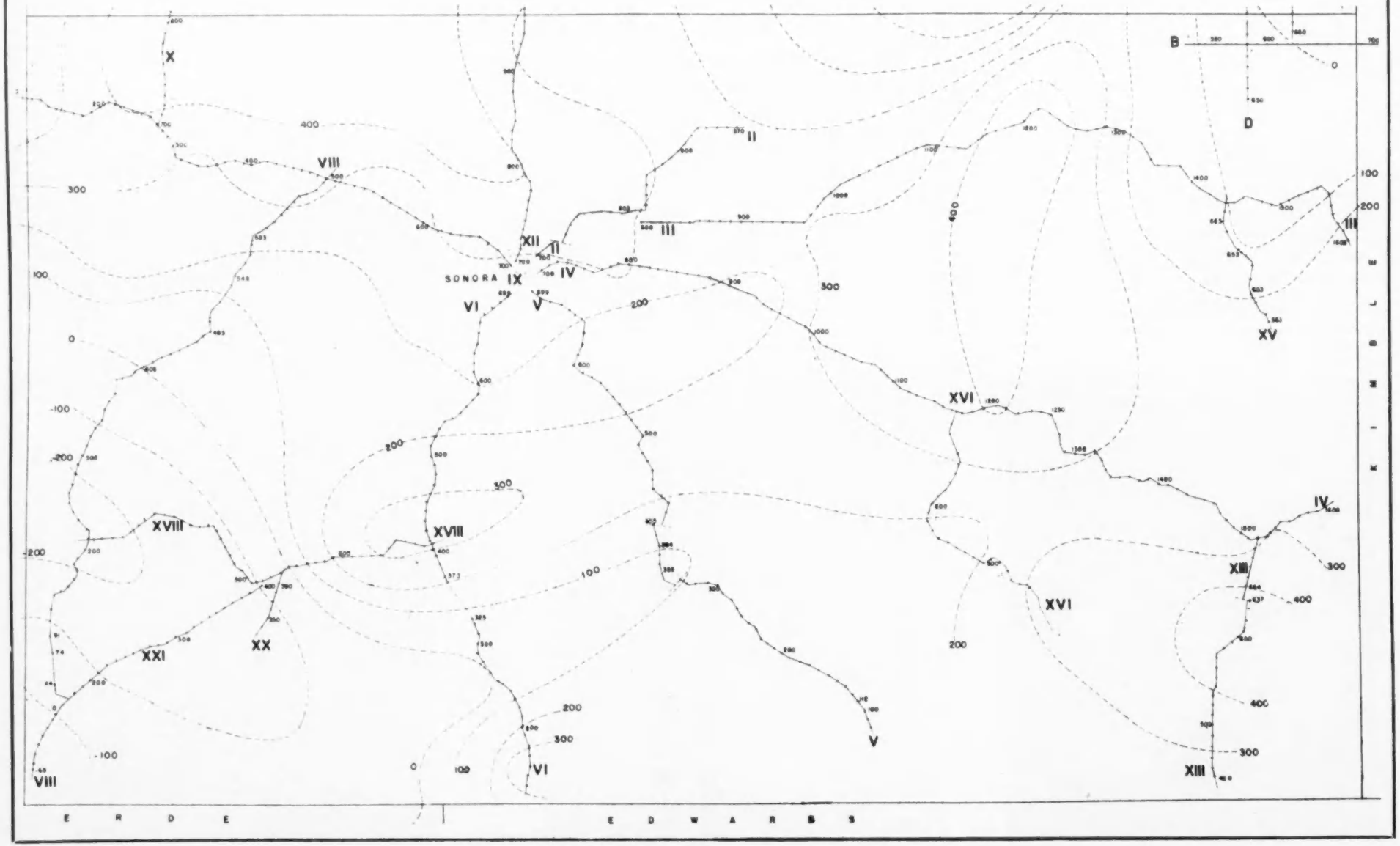
FIGURE 1.

This magnetic map of Sutton County, West Texas, is based on magnetic intensities observed along highways. Resulting isograms are of doubtful value, being physico-mathematical parameters not related to or correlated with anything of geological nature.

the new

FIGURE 2.

This magnetic map covers the same area as Figure 1, but is based on new and improved observational procedure and interpretive technique. In the improved procedure the observed curves of vertical intensities are analyzed step by step and correlated with the stratigraphic and structural pattern of area.



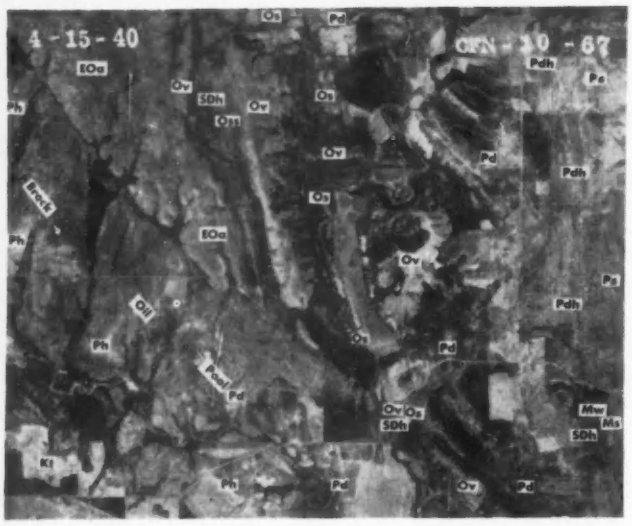


FIGURE 13.
Southern part of Criner Hills (left) and related structures, Sections 21 to 28 and 33 to 36, T5S, R1E, and Sections 1 to 4, T6S, R1E, Carter and Love counties, Okla. Abbreviations as in Figures 3, 4, 9 and 12.

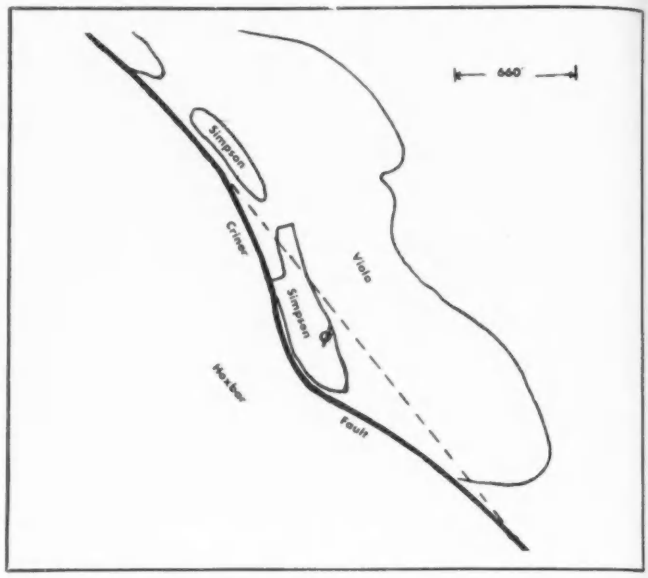


FIGURE 14.
Also Ps-Springer Series; Pdh-Dornick Hills formation; Pd-Deese formation; Ph-Hoxbar formation (Pennsylvanian); Kt-Trinity group. Right is map of part of Criner fault in Section 1, T6S, R1E, Love County, Okla.

The search for oil is being made more difficult by . . .

Odd Geologic Structures Of Southern Oklahoma

Part 2

By DR. C. W. TOMLINSON
Geologist and Producer, Ardmore, Okla.

THE PREVIOUS ARTICLE has described some of the odd geologic features of the structures of Southern Oklahoma, including pseudo-plastic folding, downfolded sediments, "rabbit ears" anticlinoria and hinge faults. These eccentric patterns have provided a wealth of clinical geologic information. But the area has other striking anomalous features.

COMPRESSIONAL "NORMAL" FAULTS, LOCALLY REVERSED: THE CRINER FAULT. Test-pits dug along the Criner fault (Figure 13) near the Brock field showed it to possess a hade of 5 to 20 degrees from vertical, of normal character, sloping toward the downthrown side.[3] Four miles farther southeast along the trace of this fault, where the trace locally budges to the west (Figure 14), a well drilled on the upthrown side 200 feet east of the trace started in the Bromide formation (Ordovician), but passed through the fault plane at a depth of about 200 feet, into Pennsylvanian beds on the downthrown side of it. The fault plane here obviously is of thrust character, with a hade of some 45 degrees in the opposite direction from its normal hade farther north.

This fault borders the main Criner Hills horst. Along such faults, nearly vertical along most of their length, there took place a considerable though usually subordinate fraction of the differential elevation of many major folds in this region, relative to the adjacent synclines. Whether technically normal or reverse faults because of local hade to one side or the other, these faults are almost certainly the product of the same compressional forces which produced the folds. They are not of tensional origin even where they possess normal hade; for the differential uplift along them relieved compressional stress by raising mountain masses above the regional level of the earth's surface adjacent to the mountain belt, and hence above the level at which the compressional forces were acting.

"PROPELLER" FAULTING: THE WASHITA VALLEY FAULT. The longest continuous fault zone in the exposed part of the Arbuckle Mountains is the Washita Valley fault zone. With connecting faults, it reaches from the southeastern extremity of the present mountain area to its northwest corner (Figure 15), and is known for 10 to 20 miles farther in both directions beneath unconformably overlying blankets of younger sediments—a total length of at least 70 miles. In the southeastern part of its course it borders the south side of the Tishomingo anticline, which contains the largest area of pre-Cambrian rocks now exposed in the Arbuckle Mountains. Here the Tishomingo granite, with a narrow discontinuous border of overturned Reagan Sandstone (Cambrian) is thrust southwestward on this fault plane over younger rocks to and including the Caney shale (Mississippian), with maximum stratigraphic displacement about 11,000 feet. The hade of the fault here may perhaps be measured by the overturning of the superjacent Cambrian sandstone, as much as 35 degrees from the vertical position.

To the northwest, the Tishomingo anticline plunges and disappears. The stratigraphic displacement on the Washita fault zone correspondingly diminishes till it passes a hinge point

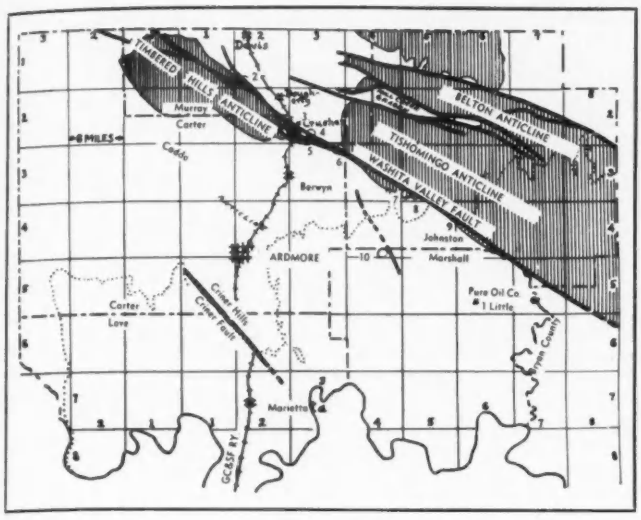


FIGURE 15.
Sketch of major faults in Ardmore district, Okla.

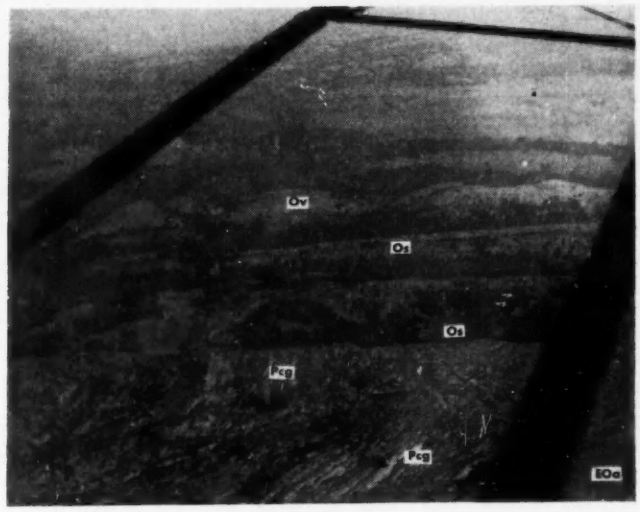


FIGURE 16.
Looking northeast across Washita Valley fault north of Price's Falls, Murray County, Okla. In foreground is Sec. 32, T1S, R2E.

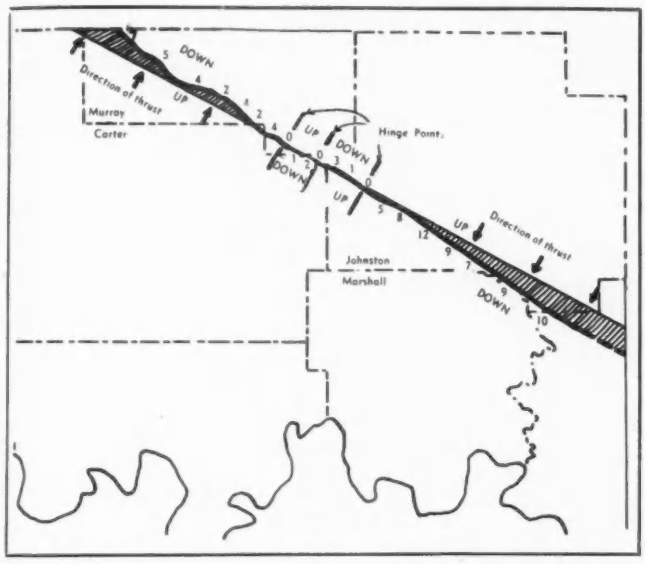


FIGURE 17.
Diagrammatic map of thrusting along Washita Valley fault.

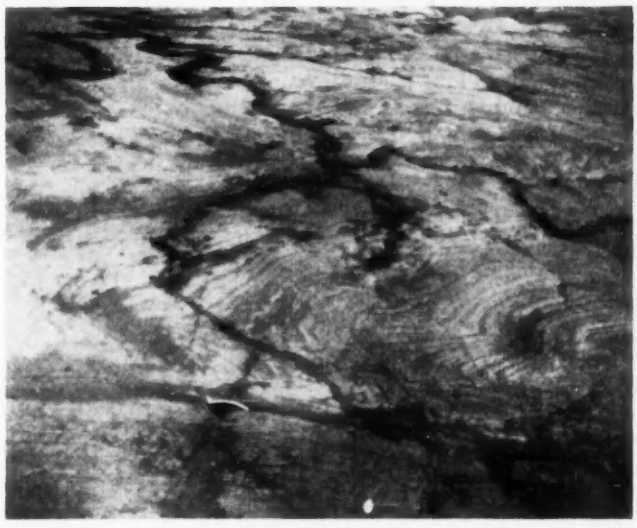


FIGURE 18.
Chapman Ranch fault in Arbuckle limestone, Secs. 17 and 18, T2S, R2E, Murray County, Okla.

and reverses the direction of displacement. But it continues past two other hinge points, and on through the shattered narrowest portion of the mountains near Crusher, where the Washita River has cut its gorge across the range. Beyond that, the fault zone follows the *northeast* side of the main (western) Arbuckle anticline. Here, the stratigraphic downthrow to the northeast increases to 2000 feet—in the reverse direction to the downthrow near Tishomingo. And to emphasize the change, there is northeastward thrusting on it, over the overturned northeast limb of this great fold (Figure 16). The fault plane is warped like a propeller blade, in opposite directions on opposite ends, either side of its group of hinge points (Figure 17).

Linked with the main fault are are others (e.g., Figure 18) which carry

FIGURE 19.
Horst-graben sliver in Simpson Group (Ordovician) in Sec. 19, T2S, R1E, Carter County, Okla.

the faulted belt on beyond the northwest end of the present mountains. A few miles farther, under cover of Permian red beds younger than these faults, still greater northeastward downthrow has been proven by drilling in the Robberson and Eola oil fields. It probably equals the 11,000-foot downthrow in the reverse direction near Tishomingo, 50 miles to the southeast along the same fault belt. And there is oil production here on *both* sides of the fault!

The thrusting, though in opposite directions at different points along the faulted belt, is in consistent relation at both places, to the adjoining major folds. In each case, the competent rocks in the core of a great uplift have been thrust, in its overturned limb, out over the incompetent younger sediments in the deep adjacent trough. The total structural height of the arch above the trough is much greater in both cases than the maximum stratigraphic displacement on the fault. The structural height of the Tishomingo anticline above the Ardmore syncline to the south is probably at least 40,000 feet; and that of the western Arbuckle anticline above the Washita Valley syncline to the north, 20,000 feet or more.

Though the axis of these two great anticlines both are approximately parallel to the Washita Valley fault zone, they lie en echelon to one another, not in line, and on opposite sides of the fault belt: the more easterly arch north of the WNW-trending fault, the more westerly arch south of it (Figure 15). The fault may first have developed in essentially vertical position throughout its length. But as the adjoining folds grew higher and the adjacent troughs were forced down, the fault furnished not only a path of least resistance for much of this differential uplift, but also a convenient avenue for outward bulging of the uplifted masses.

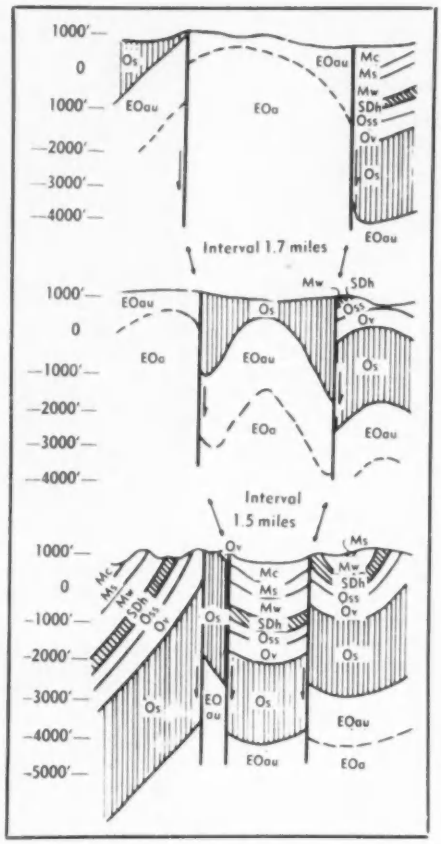


FIGURE 20.
Cross section of Crusher horst-graben at different points along its length.

FAN FOLDING: THE ARBUCKLE ANTICLINE. Just west of the Washita River, part of the south limb of the Arbuckle anticline is also overturned—southward toward the Ardmore syncline. At this point, therefore, this uplift partakes of the nature of fan folding. But in all cases, whatever its direction, the overturning or thrusting is consistently from the higher structural element toward the lower. This relationship, the great differential uplift, seem not only to have determined the direction of the local thrusting, but to have been its cause. The opposing directions of thrust reflect outward bulging of the great uplifted masses near their highest crests and along their steepest limbs: wherever those features came into being. There is no evidence of regional dominance of one direction of thrust over another, nor of consistent asymmetry of folds in one direction.

On the Caddo anticline also, both limbs display local overturning in opposite directions along U. S. Highway 77—a tendency toward fan folding.

HORST-GRABENS NEAR WOODFORD AND CRUSHER. The Arbuckle Mountain area provides two clear cut examples of what may be regarded as an even stranger phenomenon related to faulting: a longitudinally tilted graben which rises into a horst between the same pair of bordering faults. Each fault is scissored in the same direction as the other, with a hinge point between the horst and graben ends of the intervening block. The hinge points are not directly opposite each other: leaving between them a central segment of the fault block which in cross-section is neither horst nor graben, but a step in a stair, with downthrow in the same direction on both faults.

One of these odd structures, a few hundred feet wide by half a mile in length, occurs in the outcrop area of the Simpson group north of Woodford (Figure 19). The other and larger one crosses the gorge of the Washita River at Crusher (Figures 9, 10, and 20). It is about 1000 yards wide by three miles long, narrowing toward the graben (southeast) end of the block. Its seesaw tilt lifts the horst (northwest) end of the block about 5000 feet higher structurally than the graben end.

As with the "propeller" warping of the Washita Valley fault zone, the nearly vertical scissor faults bordering the Crusher horst-graben seem merely to have served as convenient avenues of differential movement. It mattered little on which side of either fault the relative uplift took place: the net result was crustal shortening, with uplift of one block or another above the level of most intense crustal compression—and above the regional level of the earth's surface.

Neither of these inconsistent grabens, nor even such a beautiful one as the Mill Creek graben, at least in its eastern part (Figure 21), need be regarded as tensional phenomena at all. It is far more probable that they and their bounding faults were formed

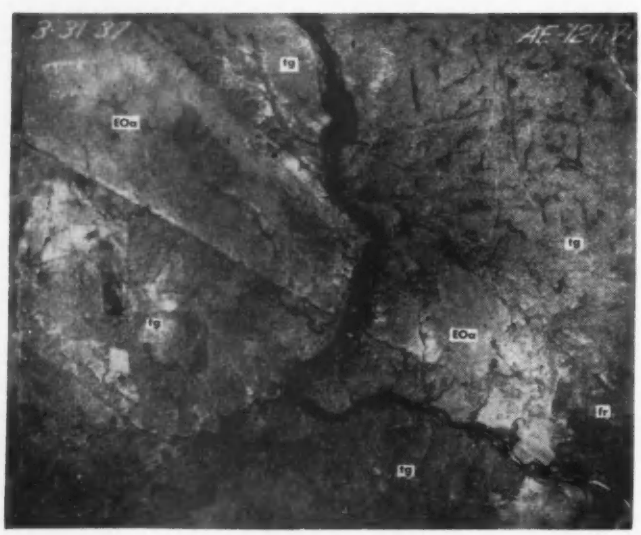
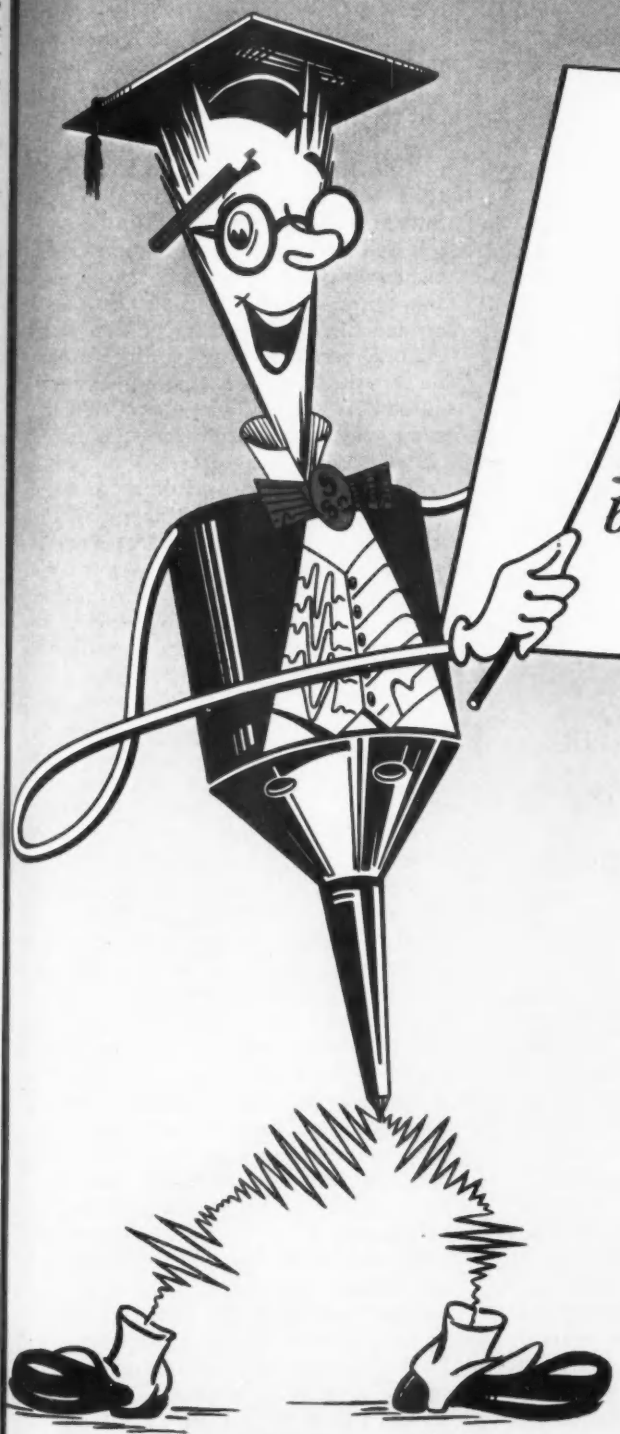


FIGURE 21.
Southeast end of the Mill Creek graben: Secs. 31 to 33, T2S, R72, and Secs. 4 to 9, T3S, R7E, Johnston County, Okla.

INTRODUCING....

PROFESSOR Doodlebug* S.S.C.



"Any ~~unscientific~~ device with which ~~it is claimed that~~ minerals including petroleum, water, etc., ~~may~~ CAN be located."

Noah Webster

Right you are Professor . . . and you are now a full-fledged member of SSC's World-Wide organization.

In the months to come, the Professor will expound on the many aspects and problems of this business of finding oil.

These discussions will be of interest to all "Doodlebugs" of the Petroleum Industry and their sponsors.

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TULSA 1, OKLAHOMA, U.S.A.

in response to compressional orogenic stresses. The strata in their floors are structurally far higher than the same beds in the basins bordering the Arbuckle Mountains. They were raised up from the regional level, but were not raised so high as the blocks on either side, nor so high as the horst portions of the horst-graben blocks themselves. One block may have been higher at one stage of the orogeny, another at another.

The use of the term "block" in that connection is misleading in a way. For these structural elements of a great uplift were not merely shifted without internal deformation, as an instructor might shuffle wooden blocks in demonstrating different types of faulting. The strata in the horst-graben at Crusher are compressed into one of the tightest folds in the region in spite of the fact that its core is the Arbuckle limestone—the thickest (6700 feet) and perhaps most competent stratigraphic unit in these mountains, above the pre-Cambrian basement. In the Arbuckle itself it is a steep, asymmetric anticline, locally overturned to the northeast. As elsewhere in this region, the differential uplift accomplished here by folding exceeds the demonstrable displacement along the fault planes. The bordering faults probably were produced in essentially the same manner as the steep thrusts above described, as avenues of differential uplift which relieved compressional stress in the underlying crust of the earth. Indeed, one of them is the Washita Valley fault, the "propeller" fault above described. The other, the Chapman Ranch fault, betrays its nearly vertical position at Crusher by crossing in an almost perfectly straight trace the narrow gorge of the Washita River, more than 200 feet deep.

These "horst-grabens" reinforce the varied directions of thrusting in the Arbuckle Mountains in emphasizing the unsystematic, almost haphazard diversity of local response to orogenic stresses in this mountain system. Yet the various structures all have one major character in common: their development helped to relieve compressional stress.

(Second of Two Parts)

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ACKNOWLEDGMENT

Prepared for WORLD OIL and with permission from the Asociacion Venezolana de Geologia, Mineria y Petroleo, Caracas, from a paper contributed to the 1952 volume of the Boletin of that society; also with permission of the American Association of Petroleum Geologists.

Improved Magnetic Methods

■ CONTINUED FROM PAGE 87

trace, are very common in the eastern part of the county. The throw of such faults is 500-700 feet, and one of them, as indicated on the map, develops a throw of 1100 feet. The large east-west striking thrust fault spreads over the central part of the county, and there is some evidence that this deformation extends into the Pennsylvanian sediments.

The depths marked on the map (Figure 2) and calculated from formulae developed by the writer do not carry, for the present, a geological prefix and serve only as a start for closed evaluation. In a detailed survey thus determined physical discontinuities could be fittingly correlated with definite geological horizons. However, for the important "datum" of Ellenburger top position, the map shows a 4300-foot depth in the northeast corner of the county. This depth decreases to 3900 in the middle of the east side of the county and drops to 4100 feet in the southeast corner of the map.

Dipping at first gently and later sharply, as a featureless monocline, the Ellenburger goes to 7700 feet in the south central part of the county and to 7900 feet in the northwest corner and plunges to more than 9600 feet in the southwest corner of the county. In general, it can be stated that Permian beds increase greatly in thickness westward, and thick Pennsylvanian beds of the central area thin out speedily in the same direction.

As far as the coverage of the county by the survey extends, it is evident that the productive possibilities of Sutton County are very limited. A few selected target areas, marked by circles and needing further detailed surveying, may bring success. The eroded Ellenburger ridge and its monoclinal, west dipping flank, bearing no measurable closures, should be excluded as a drilling objective; the same rule may apply to truncated Mississippian structures.

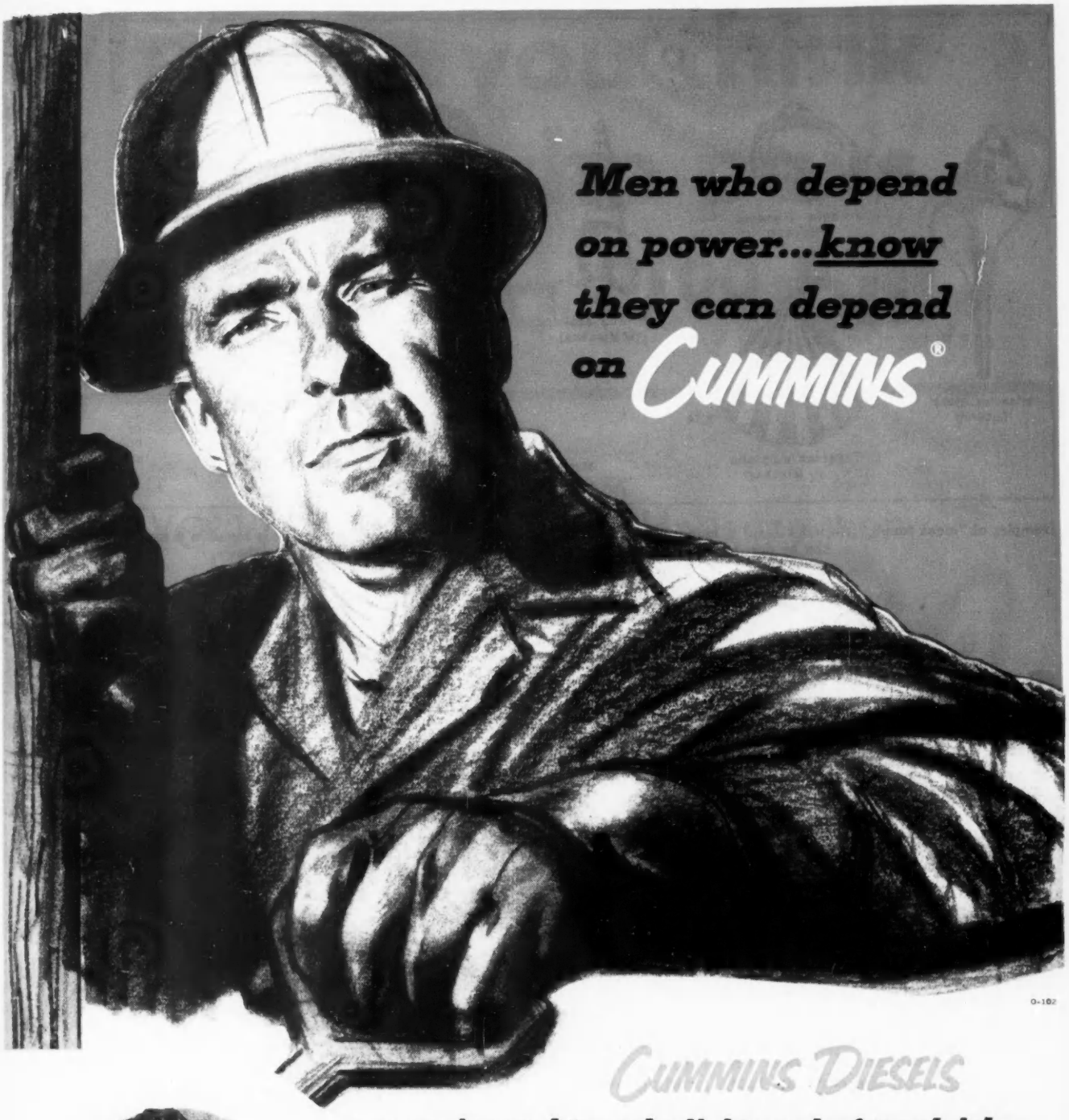
The lack of positive folding and the dominance of elongated basins in the lower Pennsylvanian of great volume of shaly sediments (and very little lime) is of small promise, except in the peripheral zones of the basins. Unconformably deposited and strongly faulted and truncated Permian beds offer some possibilities in the few extant pinchouts. The latter should be pinpointed by additional surveys. For the present, traps by faulting are omitted. The main favorable factor in this area is the widespread existence of reef limestones of the Strawn age. Their reservoir characteristics may be adversely affected in the east and central parts of the county, but the best results may confidently be expected in the northwestern part of Sutton County.

Up to date, the wildcatting campaign in Sutton County bears out the predictions of this magnetic survey, and quite apparently the other geophysical tools employed in the area were inadequate for the purpose. Once more the inadequacy of isogam technique, as an exploratory tool, is conclusively shown; and the technical advantages of magnetic surveys with a close analysis of the observed curves could place the magnetic method, undoubtedly the most economical tool of exploration, in a better competitive position than heretofore.

It might be of interest to those who chose to drill in this county, which the survey of 1948 proved to be of limited promise, to plot the dry holes on the submitted map (Figure 2). They will then realize the prodigious waste of effort and money which could have been completely avoided by proper use of magnetics.

About the Author

MARK MILSTEIN, born in Russia, has been active in geophysical work for nearly 30 years. Graduated from Mining Institute of Petrograd, he started his activity as a geologist in the oil fields of Russia, moving later to Poland and Roumania. From 1924 to 1931 he was employed by Mexican Eagle and La Corona companies in Mexico as a geophysicist in magnetic, gravity and seismic exploration. As a consulting geophysicist he spent a few years in Australia and Canada, introducing the new magnetic technique applicable to mineral and oil exploration problems. Since 1942 he has worked in the U. S. A. on specialized problems in magnetics. He is a U. S. citizen and a member of American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Seismological Society of America.



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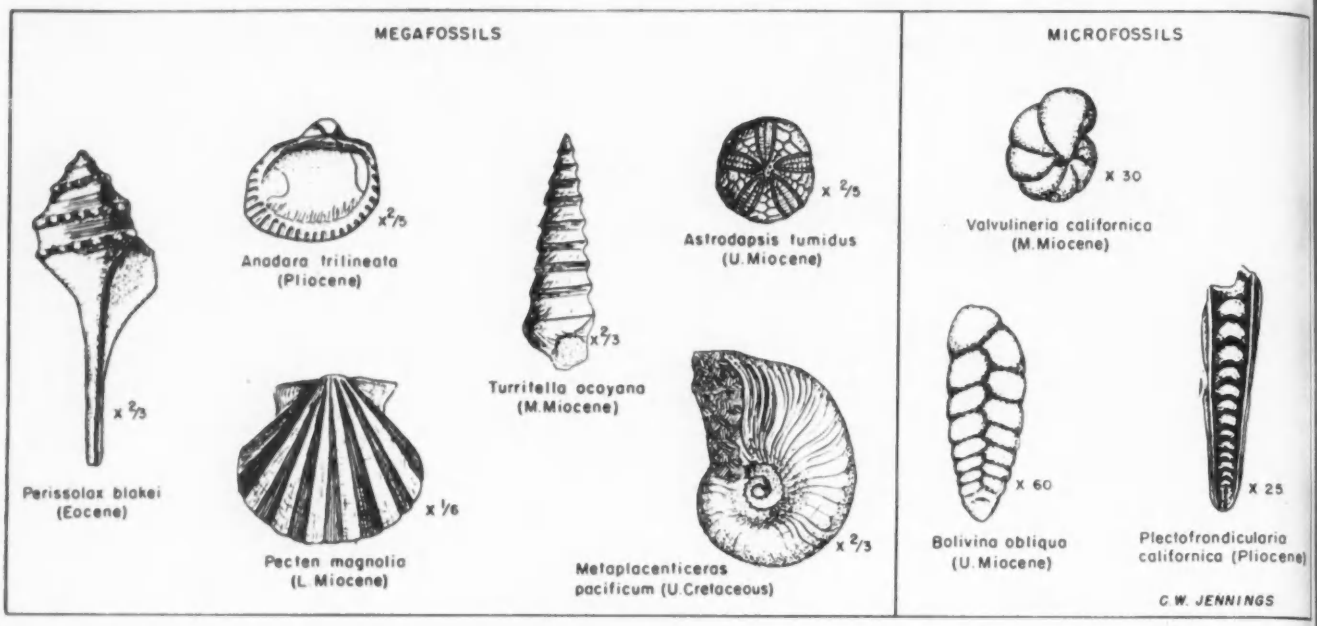

Examples of "index fossils." An index fossil is found only in beds formed during certain time interval. If one is found in a rock stratum, the stratum can be dated. The scientific name of fossil and time interval it indicates are shown.

Some Facts About Fossils

Paleontology is no longer a science confined to textbooks and museums. Today it's a valuable tool in the search for oil.

THE application of fossils in oil field discovery, development and expansion is a subject of utmost importance to the oil industry. In fact, millions of dollars depend upon the fossil correlations which are daily made by large staffs of specially trained experts in this industry.

Paleontology is no longer a science confined to textbooks and museums and it has been applied in the search for oil for some 50 years. It is seldom indeed that present-day exploration is attempted without the aid of paleontology. All who are engaged in the search for oil and gas should have some fundamental knowledge of its history and application. This brief article is presented in order to provide some basic information on a subject which, so far as the active oil man is concerned, has been sadly neglected.

Paleontology, although it started many years ago as a study with no goal other than learning for learning's sake, today has become a practical and valuable tool in the never-ending search for the earth's mineral resources.

Powell clearly outlined the scope of paleontology as follows:

"Paleontology, the science of fossils, is the geologist's clock, by which he determines the times in earth history when the beds containing the fossils were deposited. Geological time is divided into periods which are characterized by the existence of certain plants and animals. Without paleontology the geologic classification of formations, their correlation, and the determination of their mutual relations would be impossible. In fact, real and symmetrical progress in geology would be impossible without corresponding interrelated development and refinement in its handmaid, paleonotolgy. The study of the economic geology of any region of complicated structure is blind and inconsequent unless the time relations are known. These relations are indicated by the fossils which the strata contain."

Development of Geologic Time Scale

Early in the nineteenth century, while supervising work on canal excavations, William Smith, an English surveyor, made detailed notes on the succession and nature of the rocks he encountered. He noticed that fossils found in a certain rock layer were apparently characteristic of that layer in any part of England with which he was familiar. Furthermore, he observed that the rocks above the layer contained a second and different fossil group, and the bed below was characterized by still a third aggregation.

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the length and breadth of England, he published his colored geological map of England—based partly on his knowledge of fossils—which profoundly influenced the development of geology. The skill with which Smith was able to predict the kind of rock that would be found in an excavation or tunnel or the depth to which a shaft would have to be sunk in order to reach a coal seam, dramatically proved the economic value of knowing the orderly succession of rock strata.

Since the time of William Smith, much information on the occurrence of fossils and their relative position in rock strata has been recorded. It was early recognized that the older rocks contain the remains of the simpler organic forms while the more recent rocks contain a wider variety of more complex fossil forms. From this storehouse of information paleontologists have been able to arrange the fossils into chronological order and construct a relative time scale. This geologic calendar, built on fossil successions, related geologic events to one another. For interpreting the geology of the earth such a relative time scale is all that is required and a consideration of the specific number of years ago that each event took place is of little consequence.

However, spurred on by a curiosity to translate geologic time into years, geophysicists have recently succeeded in calibrating the relative time scale in terms of years by measuring the rates of disintegration of radioactive materials. The geologist's time scale or geologic column is shown as Table 1.

An Application of Fossil Correlation. By dating the rocks of the earth's strata, using fossils, the geologist is able to determine the relation of rocks in one area to those in another. Dating and correlating rock formations is paramount in any geologic investigation and especially so in the search for petroleum. The petroleum geologist continually uses his geologic calendar, as oil geology involves the study of the earth's long history from the distant past to the present.

Thus, the geologist looks for evidence of the age of each layer of sediments to learn when it was deposited, and when it was folded, faulted, or eroded. By recognizing fossils characteristic of a certain geologic time in well cores and ditch samples and accurately recording the depth at which they occur and comparing them with similar marker fossils in neighboring wells, he can take the first step in local correlation and structural interpretation. Using these data he can make geologic maps and cross sections revealing the history of the area and showing the structure of the earth's crust. Such interpretations help the geologist decide whether an exploratory well would be advisable.

Paleographic map of Southern California showing distribution of land and sea during Paleocene epoch. (After Reed and Hollister.)

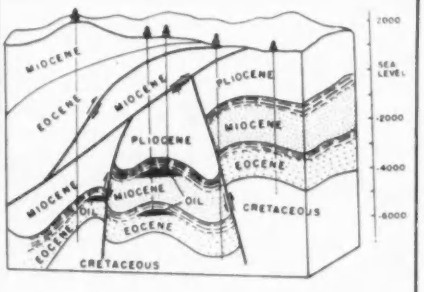

Diagram showing how age determination of strata helps to interpret geologic structure.

Different Uses of Fossils. Besides indicating the age of enclosing rocks, fossils also provide the means by which the geologist can delineate the former distribution of land and sea. Old shore lines are very important to the petroleum geologist, for he knows that oil has rarely been found except in or near rocks which were deposited in ancient ocean basins. Most geologists believe that oil is formed from the remains of ancient marine animals and plants. Furthermore, a knowledge of the distribution and association of fossil types helps the geologist determine the location of the deep and shallow parts of these former seas.

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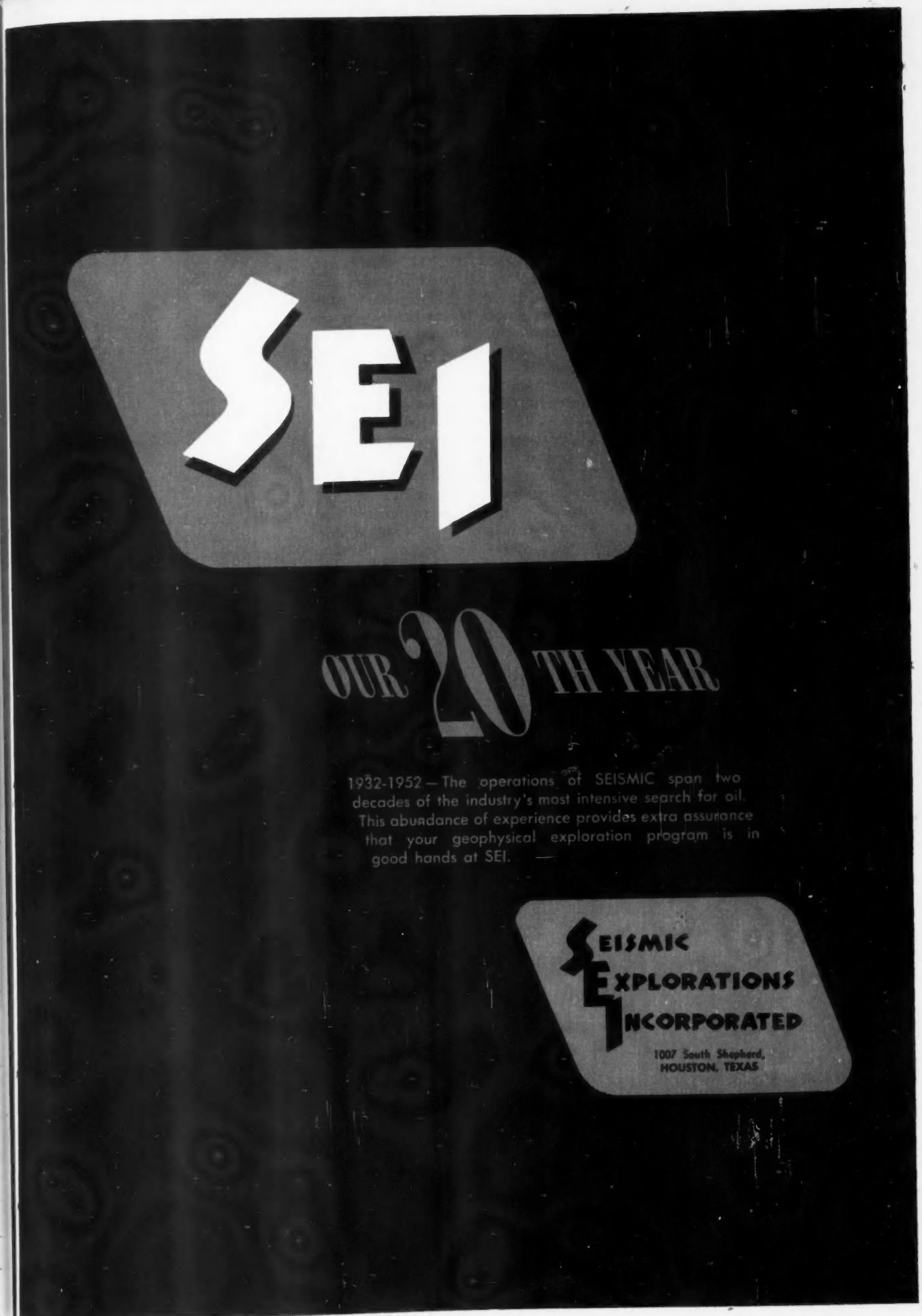
J. W. Powell, Second Director of the U. S. Geological Survey.

ACKNOWLEDGMENT

Published through courtesy of Mr. Olaf P. Jenkins, Chief, and staff members of the Department of Natural Resources, State of California, Division of Mines, San Francisco, Calif., who collaborated in its preparation.

TABLE I

Era	Period	Epoch	Approximate Age in Millions of Years (From Radioactivity)
CENOZOIC ("recent life")	QUATERNARY (Fourth, an addition to the old tripartite 18th century classification)	RECENT	
		PLEISTOCENE ("most recent")	
	TERTIARY (Third, from the 18th century classification)	PLIOCENE ("very recent")	
		MIOCENE ("moderately recent")	17 (Miocene ?)
		OLIGOCENE ("slightly recent")	
		EOCENE ("dawn of the recent")	
		PALEOCENE ("early dawn of the recent")	
MESOZOIC ("middle life")	CRETACEOUS ("chalk")		58 (End of Cretaceous)
	JURASSIC (Jura Mountains, Europe)		
	TRIASSIC (from tripartite division in Germany)		
PALEOZOIC ("ancient life")	PERMIAN (from Perm, a province in Russia)		230 (End of early Permian
	PENNSYLVANIAN (from Pennsylvania)	Carboniferous (from abundance of coal)	
	MISSISSIPPIAN (from Mississippi)		
	DEVONIAN (from Devonshire, England)		255 (End of Devonian)
	SILURIAN (from an ancient tribe, the Silures, on the Welsh border)		
	ORDOVICIAN (from another ancient tribe, the Ordovices)		350 (End of Ordovician)
	CAMBRIAN (from the Latin name for Wales)		440 (Upper Cambrian)
PROTEROZOIC ("very early life")			
ARCHEOZOIC ("beginning of life")			1880 (Pre-Cambrian Russian Karelia)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Exploratory Drilling Remains High After Slight Decline

EXPLORATORY drilling rates remained high during November, although the resulting completed wells dropped slightly from the all-time peak of the previous month. November's completed tests were fewer than those in October, but they still were considerably above the average for the preceding months.

A total of 965 exploratory ventures were reported completed during the month. That was about 50 wells more than the previous months' average, but was 117 less than the all-time high of 1082 recorded in October. Percentagewise, November's exploratory efforts were rewarded with better-than-average success. During the period, a total of 179 tests proved to be commercial producers for a score of 18.5 percent of the total drilled. A month earlier, the count had been only 15.6 percent, and for the year todate the tally has been 18.0 percent.

In the first 11 months of this year, tests totaled 10,111, and they amounted to 3.6 percent more than the 9757 finaled in last year's comparable period. Never before has exploratory completions amounted to 10,000 in any 11-month period. Results from this year's record-breaking exploration have been a little more successful than they were a year ago. So far, 1820 producers have amounted to 18.0 percent of the total, and 1748 successful tests a year before amounted to 17.9 percent of the total drilled.

November's successes included the discoveries of 126 new oil pools. These were 93 new field openers and 33 new pay discoveries. The month's distillate finds were eight new pools, and gas discoveries totaled 19. In all 153 new oil, gas or distillate pools were added to the nation's list. A month earlier, those discoveries had totaled 137. Rounding out the month's exploratory successes, were 26 major extensions to existing fields.

Summary of Results of Exploratory Drilling

ITEM	Nov., 1952	Oct., 1952	ELEVEN MONTHS January-November 1952	1951	Percent Diff.
Oil Discoveries	**126**	**102**	**1190**	**1196**	**— 0.5**
New Fields	93	86	913	886	+ 3.0
New Pays	33	16	277	310	— 10.7
Distillate Discoveries	**8**	**13**	**124**	**78**	**+ 59.0**
New Fields	5	10	105	53	+ 98.1
New Pays	3	3	19	25	— 24.0
Gas Discoveries	**19**	**22**	**187**	**200**	**— 6.5**
New Fields	14	17	149	157	— 5.1
New Pays	5	5	38	43	— 11.6
Total Discoveries	**153**	**137**	**1501**	**1474**	**+ 1.8**
Extensions to Fields	**26**	**32**	**319**	**274**	**+ 16.4**
Oil Fields	20	27	269	213	+ 26.3
Distillate Fields	2	2	10	17	— 41.2
Gas Fields	4	3	40	44	— 9.1
Total Prod. Tests	**179**	**169**	**1820**	**1748**	**+ 4.1**
Dry Holes	**786**	**913**	**8291**	**8009**	**+ 3.5**
Wildcats	765	931	8046	7665	+ 5.0
New Pays	1		12	13	— 7.7
Outposts	20	12	233	331	— 29.6
Total Expl'tory Tests	**965**	**1082**	**10111**	**9757**	**+ 3.6**
Percent Productive	18.5	15.6	18.0	17.9	
Percent Dry	81.5	84.4	82.0	82.1	

Results of Exploratory Drilling in November and First 11 months, 1952-1951, by Districts

State or District	MONTH OF NOVEMBER, 1952													FIRST ELEVEN MONTHS, 1952																	
	Productive Tests									Total Productive	Unproductive Tests			Total Exploratory Tests	Productive Tests								Total Productive		Unproductive Tests			Total Dry		Total Exploratory Tests	
	New Fields			New Pays			Extensions								New Fields			New Pays			Extensions									
	Oil	Dis.	Gas	Oil	Dis.	Gas	Oil	Dis.	Gas		Wildcats	New Pays	Outposts		Oil	Dis.	Gas	Oil	Dis.	Gas	Oil	Dis.	Gas	11 Mo. 1952	11 Mo. 1951	Wildcats	New Pays	Outposts	11 Mo. 1952	11 Mo. 1951	11 Mo. 1952	11 Mo. 1951
Alabama											2			2	1		1							2	3	33			33	21	35	24
Arizona																									2			2	4	2	4
Arkansas	3			2						5	8			13	12		2	4		2	1			21	20	99		1	100	88	121	108
California	3			1			1			5	35	1	9	50	30	1	7	20			25		2	85	77	351	3	39	393	443	478	520
Colorado	1		1							2	36			38	11	1	6	3		3	2		1	27	14	217		2	219	117	246	131
Florida																										7			7	3	7	3
Idaho																														1	1
Illinois				7		1	6			14	59			73	22		1	24		3	49			99	98	560			560	677	659	775
Indiana	7						1			8	19			27	25		2	2			17			46	51	304		2	306	404	352	455
Kansas	10		4							14	68			82	116	1	14	7			1			139	164	811			811	758	950	922
Kentucky	2									2	14			16	26			1			4			31	32	118			118	170	149	202
Louisiana	1	3	1	2					2	9	40			49	33	26	6	15	5	1	3	3	2	94	82	351	1	3	355	341	449	423
North Louisiana				1						1	27			28	13	5	4	9	3		2		1	37	39	208		3	211	218	248	257
South Louisiana	1	3	1	1					2	8	13			21	20	21	2	6	2	1	1	3	1	57	43	143	1		144	123	201	166
Michigan	1									1	18			19	16		2	6		3	4		1	32	18	220			220	292	252	310
Mississippi	2									2	11		1	14	12	2		3		1	3			21	22	143		5	148	157	169	179
Missouri																										16			16	1	16	1
Montana	1									1	7			8	7		1				2			10	6	73		2	75	52	85	58
Nebraska	1		1							2	5			7	10		3	1			2			16	22	113	1	2	116	84	132	106
Nevada																														2	2
New Mexico		1	1							2	8			10	18	3	13	9	1	3	7			54	32	109	1	1	111	76	165	108
North Dakota	1									1	8			9	5						5			10	1	18			18	8	28	9
Ohio											3			3			1				2		7	10	6	29			29	24	39	30
Oklahoma	15			3	1		5		1	25	64			89	88	9	12	32	2	1	40	1	5	190	144	677			677	619	867	763
Pennsylvania																									1	2			2		2	1
South Dakota																										5			5	2	5	2
Tennessee																														6	6
Texas	43	1	6	18	2	3	7		3	83	333		10	426	474	60	75	145	11	20	99	6	22	912	920	3601	6	174	3781	3509	4693	4429
Dist. 1 S. Central						2				2	22			24	15	6	1	1		3	7		1	34	37	306		6	312	216	346	253
Dist. 2 Middle Gulf	2	1	1	1						5	26			31	21	17	11	8			9	3	8	77	94	255	1	14	270	241	347	335
Dist. 3 Upper Gulf	5			5	2		4		2	18	29		7	54	29	17	8	50	8	9	9	3	8	141	98	291		32	323	253	464	351
Dist. 4 L. Gulf-S.W.	6		3	3		1			1	14	31			45	35	11	29	16	2	5	7		4	109	132	355	3	11	369	375	478	507
Dist. 5-E. Central											11			11	4	2					1			7	21	114		2	116	137	123	158
Dist. 6 Northeast	1									1	8			9	6	2	1	7			2			18	24	115		2	117	89	135	113
Dist. 7-B N. Cent.	13		2	3						18	89			107	152	2	14	10	1	2	4			185	206	855		9	864	902	1049	1108
Dist. 7-C W. Cent.	2			1			1			4	29			33	60	1	3	9		1	16			90	80	340		3	343	292	433	372
Dist. 8 West	8			2			2			12	36			48	57	2	1	20			31		1	112	98	363	1	5	369	353	481	451
Dist. 9 North	6			3						9	52		3	64	95		6	24			13			138	123	586	1	86	673	614	811	737
Dist. 10 Panhandle																	1							1	7	21		4	25	37	26	44
Utah	1					1				2	5			7	1					1	1			3	3	49			49	25	52	28
West Virginia															1									1	3	3			3	2	4	5
Wyoming	1									1	22			23	5	2	3	5			2			17	29	135		2	137	123	154	152
Total U. S.	93	5	14	33	3	5	20	2	4	179	765	1	20	965	913	105	149	277	19	38	269	10	40	1820	1748	8046	12	233	8291	8009	10111	9757

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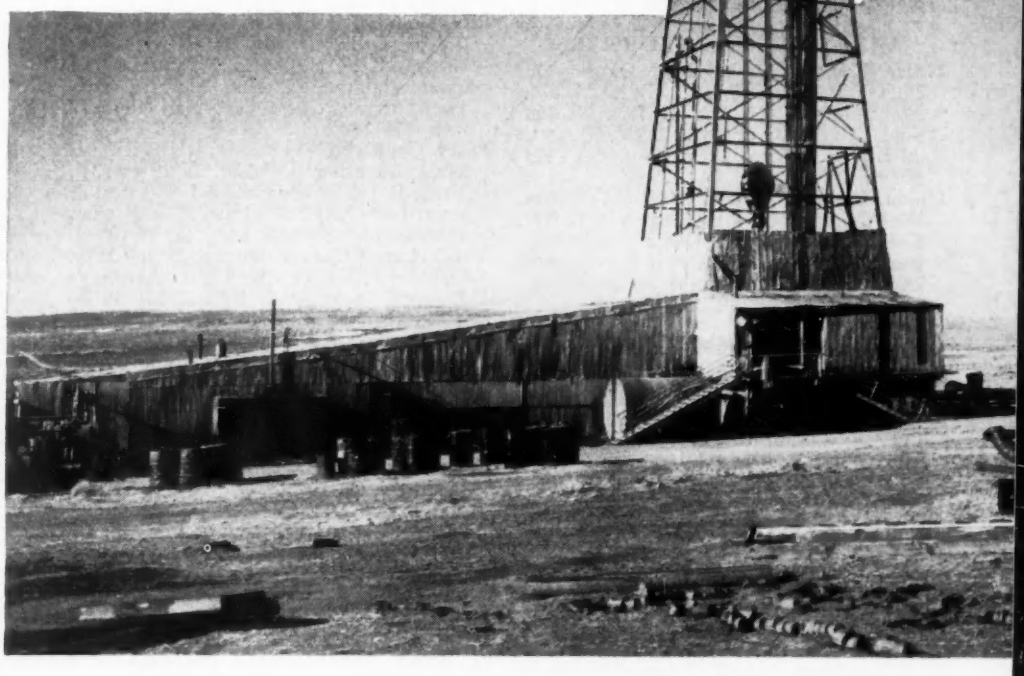

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ARKANSAS—NEW OIL FIELDS

Miller County, Fouke, West field. Jay Simmons' S. G. Dildy 1, CN½ SW NW 21-17s-27w, flowed 103 barrels of oil and 56 barrels water from Paluxy sand, Lower Cretaceous 4302-06 feet, 12/64-inch, 35-gravity, completed 10-20-52, TD 4306.

Ouachita County. Alcan Oil Co.'s Mary Slaughter 1, SE SW 14-14s-19w, pumped 94 barrels from Buckrange sand, Upper Cretaceous 1962-76 feet, 30-gravity, completed 11-7-52, TD 2002.

Union County, Calion area. Kirby Petroleum Co.'s Southern Company A-1, C SE SW NW 18-16s-14w, pumped 50 barrels from Blossom sand, Upper Cretaceous 2599-2608 feet, 22-gravity, completed 11-29-52, TD 3543.

ARKANSAS—NEW OIL PAYS

Miller County, Fouke field. Carter Oil Co.'s W. P. Sturgis 19, NE NE 1-17s-27w, pumped 15 barrels from Tokio sand, Upper Cretaceous 2955-60 feet, 22-gravity, completed 11-13-52, TD 3022.

Union County, Hibank field. McAlester Fuel Co.'s H. G. Pendleton A-2, C SW SW NE 24-18s-15w, flowed 105 barrels from Meakin sand, Upper Cretaceous 2434-36 feet, 11/64-inch, 29.5-gravity, completed 11-3-52, TD 2595.

CALIFORNIA—NEW OIL FIELDS

Kern County, McDonald Anticline area. Ferguson & Bosworth's Layman 10, in 18-28s-20e, flowed 120 barrels from Buttonbed sand, Miocene 2093-2165 feet, 24-gravity, completed 11-12-52, TD 2165.

Los Angeles County, Leffingwell area. The Texas Co.'s McNally Ranch "B" 10-1, in 10-3s-11w, pumped 53 barrels from 8820-8935 feet, 29.1-gravity, completed 11-21-52, TD 10,000.

Santa Barbara County, Russell Ranch area. Richfield Oil Corp.'s Russell A-15-9, NW SW 9-10n-27w, flowed 162 barrels from 3596-3672 feet, 12/64-inch, 39.5-gravity, completed 11-7-52, TD 4190.

CALIFORNIA—NEW OIL PAY

Kern County, Edison field. General Petroleum Corp.'s Graham 41X-9, NE NW 9-30s-29e, Old Well Worked Over, flowed 291 barrels from Pyramid Hills sand, Miocene 4990-5020 feet, 14/64-inch, 41.5-gravity, completed 11-11-52, TD 5363.

CALIFORNIA—OIL FIELD EXTENSION

Los Angeles County, Athens-Rosecrans field. Royalty Service Corp.'s Compton 1, in 20-3s-13w, pumped 16 barrels from 5184-90 feet, 24-gravity, completed 11-14-52, TD 5994.

COLORADO—NEW OIL FIELD

Washington County. R. L. & J. L. Rush's J. W. Jones 1, SE SE NW 25-3s-51w, pumped 162 barrels from "D" sand, Upper Cretaceous 3911-19 feet, 22.2-gravity, completed 11-21-52, TD 3965.

COLORADO—NEW GAS FIELD

Washington County. Southern Production Co. Inc.'s Mott 1, SW SW SW 23-3n-53w, flowed 6 million from "J" sand, Upper Cretaceous 4844-50 feet, completed 11-5-52, TD 5169.

INDIANA—NEW OIL FIELDS

Gibson County. George & Wrather-Ernie T. Wix's Leonard W. Haley 1, NW NW NW 9-3s-9w, pumped 77 barrels from Jackson sand, Mississippian 1575-87 and 1606-12 feet, TD 1750.

Unnamed field. Sanders & Fye's Eli Kohlmeyer 1, SW NE NW 21-3s-9w, pumped 30 barrels from Cypress sand, Mississippian 1564-70 feet, TD 1990.

Knox County. Affeld Oil Co.'s Harvey A. Starrett 1, NE NE SE 20-2n-8w, pumped 84 barrels from Rosiclare lime, Mississippian 1411-15 feet, TD 1415.

Pike County. Boling-Levine-Yabrove & Calvert Drilling's Milburn & Opal Hubbard 1, NW NW 14-1s-9w, pumped 16 barrels oil and 65 barrels water from Jackson sand, Mississippian 1378-97 feet, TD 1762.

Posey County. Calvert Drilling, Inc.'s Mark Guenther 1, SW SE SE 19-4s-13w, pumped 162 barrels oil and 180 barrels water from McClosky lime, Mississippian 2880-86 and 2934-38 feet, TD 3019.

Vanderburgh County. Stanley Welch-F. B. Drilling Co. & Alan Hachenberger's Ewin H. Kuester 1, SE SE SE 35-7s-11w, pumped 56 barrels oil and 15 barrels water from McClosky lime, Mississippian 2476-85 feet, TD 2485.

Vigo County, Riley, South field. Sun Oil Co.'s McIntosh-Ray Unit 1, NW NE NW 34-11n-8w, pumped 187 barrels oil and 50 barrels water from Upper Devonian lime 1683-88 feet, TD 1696.

INDIANA—OIL FIELD EXTENSION

Gibson County, Princeton field. Ernie I. Barker-Paco Petroleum Co.'s Oral & Mary Tate 1, SW SW NW 16-2s-10w, ¾-mile south extension, pumped 100 barrels from Rosiclare lime, Mississippian 2093-2101 feet, TD 2149.

ILLINOIS—NEW OIL PAYS

Clay County, Sailor Spring, Central field. G. Marvin's Kenley 1, NE SE SE 36-4n-7e, Old Well Worked Over, pumped 19 barrels oil and 40 barrels water from Tar Springs sand, Mississippian 2330-39 feet, completed 11-18-52, TD 3065.

Edwards County, Bone Gap Consolidated field. V. R. Gallagher's Briggs 1, NE NE SW 19-1s-14w, pumped 18 barrels from Pennsylvanian sand, Pennsylvanian 2108-16 feet, completed 11-25-52, TD 2341.

Washington County, Beaucoup field. Collins Bros.' Stricker-Meinert "B" 3, NW SE NW 10-2s-2w, pumped 50 barrels oil and 50 barrels water from Trenton lime, Ordovician 4093-98 feet, completed 11-25-52, TD 4192.

Wayne County, Ellery Consolidated field. Illinois Mid-Continent Oil Co.'s J. H. Piercy 1, NE NE NW 25-2s-9e, pumped 250 barrels from St. Louis lime, Mississippian 3418-30 feet, completed 11-11-52, TD 3440.

White County, Epworth Consolidated field. Oil Management, Inc.'s Hanna 6, NW SE NE 31-5s-10e, pumped 35 barrels from Waltersburg sand, Mississippian 2350-55 feet, completed 11-11-52, TD 3035.

Maunie, North field. Ashland and O'Neil's Bingham 1, SW NW SE 10-5s-14w, ½-mile east of production, pumped 168 barrels from Waltersburg sand, Mississippian 2303-13 feet, completed 11-25-52, TD 2313.

Sumpter, East field. George & Wrather's H. E. Brown 1-B, SW NW NE 32-4s-10e, pumped 26 barrels from Rosiclare lime, Mississippian 3139-44 feet, completed 11-25-52, TD 3155.

ILLINOIS—OIL FIELD EXTENSIONS

Clark County, Siggins field. Fredenhagen's F. Miller 1, SW SW NW 6-10n-14w, ½-mile north extension, pumped 2 barrels from Pennsylvanian sand, Pennsylvanian 460-71 feet, completed 11-11-52, TD 500.

Gallatin County, Inman West Consolidated field. Nation Oil Co.'s Westphaelinger 1, SW SW SE 12-8s-9e, ¾-mile extension, pumped 9 barrels oil and 13 barrels water from Renault lime 2778-83 feet and McClosky lime, Mississippian 2941-44 feet, completed 11-18-52, TD 2948.

Hamilton County, Dale Consolidated field. The Texas Co.'s W. T. Lane 1, SE NW NE 32-5s-6e, 1-mile extension, pumped 26 barrels oil and 67 barrels water from McClosky lime, Mississippian 3336-39 feet, completed 11-18-52, TD 3401.

Jasper County, Ste. Marie field. Calvert Drilling Co.'s A. Jenkins 1, in 18-5n-11e, Old Well Worked Over, 1-mile southwest extension, pumped 24 barrels oil and 70 barrels water from McClosky lime, Mississippian 2926-31 feet, completed 11-4-52, TD 3034.

Wayne County, Goldengate, West field. Continental Drilling Co.'s Hoffee 1, SW NE 6-2s-9e, ½-mile extension, pumped 130 barrels from Lower O'hara lime, Mississippian 3291-95 feet and McClosky lime, Mississippian 3336-44 feet, completed 11-25-52, TD 3380.

White County, Concord, South field. Tuley and Carter's S. J. Tuley 1, NE SE NW 8-7s-10e, ½-mile extension, pumped 15 barrels oil and 2 barrels water from Aux Vases sand, Mississippian 2899-2915 feet, completed 12-2-52, TD 2918.

ILLINOIS—NEW GAS PAY

White County, Epworth Consolidated field. B. Lambert's Calvert 1, NE NW NW 32-5s-10e, flowed 4.5 million from Pennsylvanian sand, Pennsylvanian 1096-1102 feet, completed 11-18-52, TD 3206.

KANSAS—NEW OIL FIELDS

Barton County. Don Ingling & L. B. Smith's Cochrane 1, SE NW SE 5-17s-13w, pumped 25 barrels from Arbuckle lime, Ordovician 3371-76 feet, TD 3376.

Unnamed field. J. A. Terteling & Sons' Kramp 1, NW NE NE 7-19s-11w, pumped 90 barrels from Arbuckle lime, Ordovician 3353-85 feet, TD 3385.

Ellis County. Flynn Oil's Weisner 1, NW NW NW 36-12s-20w, ungauged from Conglomerate 3863-76 feet and 3882-90 feet, TD 3947.

Gove County. Skiles' Beougher 1, NW NW SE 8-13s-30w, pumped 4 barrels

from Lansing lime, Pennsylvanian 4079-82 and 4129-39 feet, TD 4170.

Kingman County, Casley field. Pabco Drilling Co.'s Casley 1, SW SW NW 11-28s-5w, pumped 318 barrels from Mississippian dolomite, Mississippian 3797-3801 feet, TD 3801.

Saline County, Salemsborg field. Al Phillips & Sanderson's Johnson 1, SW SW SW 5-16s-3w, pumped 120 barrels from Maquoketa dolomite, Ordovician 3436-43 feet, TD 3443.

Stafford County, Koelsch, Southeast field. Hilton Drilling Co.'s Koelsch 1, NE SE SW 25-24s-14w, potentialed 3000 barrels from Arbuckle lime, Ordovician 4191-93 feet, TD 4193.

St. John, North field. Derby Oil & Lindas' Schultz 1, NE NE SE 20-23s-13w, pumped 505 barrels from Lansing-Kansas City lime, Mississippian 3603-07 feet, TD 3968.

Syms, Southeast field. Ed Adair & Lee Phillips' Shumway 1, NW NW NW 27-21s-12w, potentialed 2120 barrels from Arbuckle lime, Ordovician 3566-69 feet, TD 3569.

Sumner County. Herndon Drilling Co.'s Kerr 1, SE NW NE 18-35s-1e, pumped 18 barrels from Mississippi Chat, Mississippian 3594-3621 feet, TD 3890.

KANSAS—NEW GAS FIELDS

Meade County. Columbian Fuel Corp.'s Adams "K" 1, C SE NE 11-35s-30w, flowed 3.7 million from Morrow sand, Mississippian 5760-70 feet, open, TD, 6100.

Morton County. Cities Service Oil Co.'s Boehm A-1, NE NE NW 11-33s-42w, flowed 15.8 million from Topeka sand, Pennsylvanian 2988-3018 feet, open, TD 5152.

Pawnee County. Nadel & Gussman's Bird 1, NW NW NW 19-21s-15w, flowed 18.4 million from Arbuckle lime, Ordovician 3810-17 feet, open, TD 3917.

Seward County. Tomilson Producers' Long 1, C NW NW 33-34s-31w, flowed 2 million from Mississippi lime, Mississippian 5959-86 feet, TD 6800.

KENTUCKY—NEW OIL FIELDS

Hopkins County. Basin Drilling Co.-George Hoffman-W. G. Reynolds' R. L. Igleheart 1, in 9-L-26, pumped 30 barrels from Point Creek sand, Mississippian 2459-66 feet, TD 2772.

McLean County. S. W. Bardill-Shaw Oil & Chemical Co.-Inland Petroleum's O. B. Owens 1, NE SE SW 6-M-30, pumped 22 barrels from Tar Springs sand, Mississippian 1373-95 feet, TD 1397.

NORTH LOUISIANA—NEW OIL PAY

DeSoto Parish, Grogan field. R. P. Bufkin's Mary Yancy 1, C SE SE NW 1-10n-11w, flowed 16 barrels from Nacatoch sand, Upper Cretaceous 1200-45 feet, ¾-inch, 46-gravity, completed 11-11-52, TD 1245.

SOUTH LOUISIANA—NEW OIL FIELD

Avoyelles Parish, Lake St. Agnes area. Kemp Drilling Co.'s Fisher 1, in 34-3n-5e, flowed 124 barrels from Wilcox sand, Eocene 7403-05 feet, 9/64-inch, 42.6-gravity, completed 11-1-52, TD 8505.

SOUTH LOUISIANA—NEW OIL PAY

Plaquemines Parish, Lake Washington field. J. W. Mecom & Freeport Sulphur's E. Cockrell Jr. et al 6, in 34-19s-26e, flowed 537 barrels from Upper Miocene sand 12,284-294 and 12,300-312 feet, 12/64-inch, 38.5-gravity, completed 11-24-52, TD 12,646.

SOUTH LOUISIANA—NEW DISTILLATE FIELDS

Acadia Parish, West Church Point area. Union Sulphur & Oil Corp.'s Dewey M. Harmon et al 1, in 51-7s-2e, flowed 53 barrels distillate and 1.5 million from Miocene sand 10,235-240 feet, 12/64-inch, 52.2-gravity, completed 11-17-52, TD 11,208.

St. Charles Parish. F. A. Callery, Inc.'s Home for Incurables et al 1, in 1-13s-20e, flowed 101 barrels distillate and 27 million from 10,407-411 feet, 14/64-inch, completed 11-1-52, TD 10,520.

St. Laundry Parish, LeLaux area. Sunray Oil Corp.'s Simon LaLonde 1, in 116-6s-4e, flowed 28 barrels distillate and 5.6 million from Cockfield sand, Eocene 10,810-840 feet, 12/64-inch, 46-gravity, completed 11-30-52, TD 12,559.

SOUTH LOUISIANA—DISTILLATE FIELD EXTENSIONS

Calcasieu Parish, Gillis-English-Bayou field. The California Co.'s W. D. Jones et al 1, in 18-9s-7w, ½-mile east extension, flowed 138 barrels distillate from 10,740-780 feet, 10/64-inch, 47.2-gravity, completed 11-7-52, TD 11,150.

St. Martin Parish, Happytown field. R. R. Frankel's V. J. Kurzweg, Jr. 1, in 114-7s-8e, 1-mile west extension, flowed 65 barrels distillate and 1.1 million from Miocene sand 10,527-530 feet, 9/64-inch, completed 11-10-52, TD 11,400.

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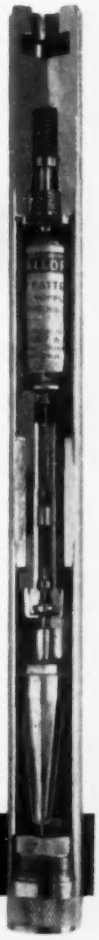

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SOUTH LOUISIANA—NEW GAS FIELD

St. Charles Parish. The California Co.'s R. L. Smart-USA 1, in 12-12s-7e, flowed 2.2 million from 10,120-134 and 10,092-110 feet, 10/64-inch, completed 11-3-52, TD 11,600.

MICHIGAN—NEW OIL FIELD

Clare County. Lud Segerlund's Caner et al 1, NE NE NE 11-19n-5w, Greenwood Township, pumped 14 barrels oil and 34 barrels water from Dundee lime, Devonian 4052-64 feet, TD 4064.

MISSISSIPPI—NEW OIL FIELDS

Adams County. John S. Callon's Mrs. May Field Hodges 1, in 10-6n-4w, flowed 360 barrels from Campbell (Wilcox) sand, Eocene 6200-04 feet, 9/64-inch, 40.5-gravity, completed 11-28-52, TD 7013.

Franklin County, Garden City field. Gulf Refining Co.'s N. W. McCraine 3, in 6-4n-1e, pumped 76 barrels from Upper Wilcox sand, Eocene 4716-25 and 4728-29 feet, 32.6-gravity, completed 11-25-52, TD 6809.

MONTANA—NEW OIL FIELD

Dawson County. The Texas Co.'s NPRR-NCT No. 6 G-1, C SW NW 11-15n-54e, flowed 28 barrels oil and 250 barrels water from Ordovician 8992-9025 feet, 5/16-inch, completed 11-18-52, TD 10,076.

NEBRASKA—NEW OIL FIELD

Banner County. Magnolia Petroleum Co.'s Van Pelt 1, SW SW SW 24-18n-56w, pumped 42 barrels oil and 8 barrels water from "J" sand, Upper Cretaceous 6472-82 feet, completed 11-20-52, TD 6530.

NEBRASKA—NEW GAS FIELD

Cheyenne County. Ohio Oil Co.'s T. A. Spicknell 1, NW NW NE 10-13n-50w, flowed 10.8 million from "J" sand, Upper Cretaceous 4764-75 feet, completed 11-10-52, TD 4840.

NEW MEXICO—NEW DISTILLATE FIELD

Lea County. Lawton Oil Co.'s State-Gulf 2, in 10-13s-33e, flowed 112 barrels distillate and 1.3 million from Pennsylvanian sand 11,340-380 feet, 5/8-inch, 54.9-gravity, completed 10-23-52, TD 13,080.

NEW MEXICO—NEW GAS FIELD

Lea County. Tide Water Associated Oil Co.'s R. M. Marshall 1-D, in 13-21s-36e, Old Well Worked Over, flowed 1.1 million from 3650-3800 feet, 2½-inch, completed 11-17-52, TD 7087.

NORTH DAKOTA—NEW OIL FIELD

Williams County. Amerada Petroleum Corp.'s State 1-E, C NW NW 16-154n-95w, flowed 50 barrels oil and 33 barrels water from Madison lime, Mississippian 8674-8720 feet, 10/64-inch, 40.2-gravity, completed 10-24-52, TD 8928.

OKLAHOMA—NEW OIL FIELDS

Cleveland County. Randall R. Morton's Capehart 1, NW SW SE 14-8n-1e, flowed 300 barrels from 2nd Wilcox sand, Ordovician 6271-79 feet, 11/64-inch, 41-gravity, TD 6279.

Garvin County. Cities Service Oil Co.'s McCurley 1, C SW NE 19-3n-1w, flowed 199 barrels from 2nd Bromide sand, Ordovician 5256-65 feet, 20/64-inch, 44.2-gravity, TD 6495.

Unnamed field. Magnolia Petroleum Co.'s L. P. Duncan 1, NE NE SE 1-3n-

4w, flowed 566 barrels from Springer sand, Pennsylvanian 9010-62 feet, ½-inch, 38-gravity, TD 9180.

Kay County. Manahan Oil Co.'s Charlie Bowman 1, SW SW NW 35-27n-1e, pumped 15 barrels oil and 70 barrels water from Simpson sand, Ordovician 4012-16 feet, 41-gravity, TD 4131.

Lincoln County. L. W. G. Production Co.'s H. R. Porter 1, SE SE NW 35-14n-4e, Old Well Drilled Deeper, pumped 58 barrels oil and 40 barrels water from Skinner sand, Pennsylvanian 3952-57 feet, 35-gravity, TD 4288.

Logan County. A. O. Olson's W. W. Filtz 1, SE SE SE 34-20n-3w, Old Well Worked Over, flowed 190 barrels from 2nd Wilcox sand, Ordovician 5895-5940 feet, ¼-inch, 41-gravity, TD 6105.

Unnamed field. Davon Oil and Gas Co.'s Ringrose 1, NE SW SE 4-16n-1w, flowed 48 barrels from Skinner sand, Pennsylvanian 5154-60 feet, 22/64-inch, 50-gravity, TD 5684.

McClain County. Harry J. Schafer et al's Sasser 1, NW SE NW 30-6n-2w, flowed 41 barrels from Bois D'Arc lime, Devonian 7770-7820 feet, 5/32-inch, 46-gravity, TD 10,135.

Unnamed field. Sinclair Oil & Gas Co.'s Community-Willie Smith 1, C SW NW 17-5n-4w, flowed 1950 barrels from Upper McLish sand, Ordovician 11,278-305 feet, 45-gravity, TD 12,495.

Noble County. Fordee-Rhoades Oil Co.'s Lyhane 1, NW SW SE 24-23n-2w, flowed 150 barrels from 1st Wilcox sand, Ordovician 4752-58 feet, 20/64-inch, TD 4758.

Okfuskee County. Charles Joels & Parris Mfg. Co.'s Jonas Harjo 1, SE NE NE 28-11n-11e, pumped 100 barrels from Gilcrease sand, Pennsylvanian 2627-39, 2724-30 and 2814-18 feet, TD 2945.

Osage County. Norbla Oil's Osage 2, NW NW NW 9-24n-6e, pumped 8 barrels oil and 24 barrels water from Mississippi Chat 2840-59 feet, TD 2859.

Pottawatomie County. Owen H. Rives' Teas 1, SE NE NW 9-9n-4e, pumped 26 barrels from Hunton lime, Devo-Silurian 4468-78 feet, 40-gravity, TD 4725.

Seminole County. Jimmie Austin's Patton 1, SW SW SE 31-7n-6e, pumped 2 barrels from Pennsylvanian sand 1170-80 feet, TD 3260.

Stephens County. R. V. Dillard Drilling Co. et al's Harley 1, SW SE NE 21-2s-4w, pumped 8 barrels from 682-978 feet, 23-gravity, TD 1455.

OKLAHOMA—NEW OIL PAYS

Creek County, Mosquito Creek, West field. Thompson & Lee's Kelly Harring 2, NW NW SW 21-17n-8e, Old Well Drilled Deeper, flowed 288 barrels from Wilcox sand, Ordovician 3539-43 feet, 6/64-inch, 45-gravity, TD 3543.

Logan County, Seward field. Ryan Oil Co.'s Anna E. Camp et al 1, SE SW SW 23-15n-3w, flowed 265 barrels from Simpson dolomite, Ordovician 6159-76 feet, 11/64-inch, 38-gravity, TD 6966.

Marshall County, Madill field. L. W. Powell's Godfrey-Welch 2, NE SE NW 31-5s-6e, pumped 7 barrels from Springer sand, Pennsylvanian 1526-55 feet, 37-gravity, TD 1555.

OKLAHOMA—OIL FIELD EXTENSIONS

Creek County, Mannford field. O. F. Warren's R. M. Wheeler, et al 1, C NE NE NW 30-18n-9e, west extension, pumped 11 barrels from Red Fork sand, Pennsylvanian 2514-32 feet, TD 2799.

Noble County, Longview, Northeast field. Mid-Continent Petroleum Corp.'s Gray Hawk 1, SW SE SE 29-24n-1e, northeast extension, pumped 15 barrels from Bartlesville sand, Pennslyvanian 4294-4300 feet, TD 4345.

Osage County, Kaw, South field. C. W. Oliphant's Osage 1, C SW SE 31-26n-5e, northeast extension, pumped 40 barrels from Mississippi lime, Mississippian 3312-16 feet, 43-gravity, TD 3316.

Osage County, Naval Reserve field. Kewanee Oil's Osage 1, NE SE SW 30-25n-7e, north extension, flowed 640 barrels from Burbank sand, Pennsylvanian 2645-2722 feet, TD 2722.

Pottawatomie County, Asher, West field. Bert Aston's Huff 1, SW NW NE 14-6n-3e, north extension, pumped 8 barrels from Layton sand, Pennsylvanian 2888-93 feet, 23-gravity, TD 2900.

OKLAHOMA—NEW DISTILLATE PAY

Beaver County, Floris field. Carter Oil Co.'s Minnie B. Dorman 1, C NE NE 30-5n-22ecm, flowed 48 barrels distillate and 12 million from Chester lime, Mississippian 6596-6620 feet, 37/64-inch, TD 7208.

OKLAHOMA—GAS FIELD EXTENSION

Beaver County, Light field. J. M. Huber Corp.'s Sid Sharp 1, C NW NE 13-6n-21ecm, flowed 104.7 million from Morrow sand, Pennsylvanian 5977-6002, open, TD 6347.

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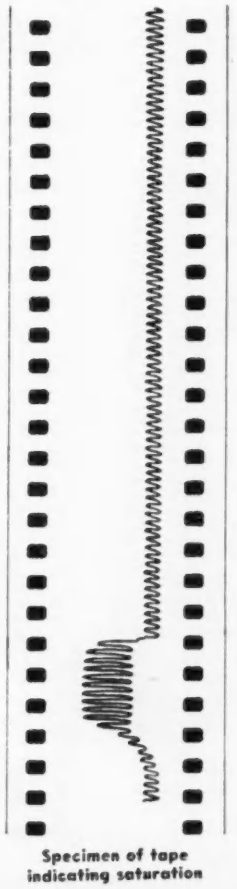

Specimen of tape indicating saturation

TEXAS DISTRICT 1—NEW GAS PAYS

Frio County, Big Foot field. Lundells Inc.'s M. R. Chiles 1, Henry Castro Survey No. 119, ungauged from Navarro sand, Upper Cretaceous 2982-3042 feet, completed 11-15-52, TD 3042.

McMullen County, Rhode field. Humble's W. W. Rhode B-1, Gustav Frasch Survey No. 82, C. W. Hahl subdivision of Lorenz Ranch, flowed 7.6 million from Wilcox sand, Eocene 7670-80 feet, open, completed 10-24-52, TD 8000.

TEXAS DISTRICT 2—NEW OIL FIELDS

Live Oak County, Hailey area. Tri Mark Oil Corp.'s J. I. Hailey 5, P. Miller Survey, flowed 179 barrels from Hockleyensis sand, Eocene 4256-61 feet, 3/16-inch, 35.1-gravity, completed 10-20-52, TD 4261.

Ramirena, Southwest field. Humble's Mary Davidson 1, J. M. C. Nixon Survey, flowed 72 barrels from Jackson-Cockfield sand, Eocene 5166-74 feet, 1/8-inch, 43.6-gravity, completed 11-16-52, TD 5473.

TEXAS DISTRICT 2—NEW OIL PAY

Victoria County, McFaddin, East field. Union Producing Co. et al's McFaddin A-31, Jose Marie Valdez Survey, flowed 120 barrels oil and 36 barrels water from Frio sand, Oligocene 6915-17 feet, 1/8-inch, 41.4-gravity, completed 11-16-52, TD 8586.

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TEXAS DISTRICT 2—NEW DISTILLATE FIELD

Bee County. Warren Petroleum Corp.'s Mrs. Rosa E. Borroum 1, C. Williams Survey, flowed 1100 barrels distillate and 10.5 million from Slick-Wilcox sand, Eocene 7313-23 and 7342-52 feet, open, completed 10-20-52, TD 8330.

TEXAS DISTRICT 2—NEW GAS FIELD

Victoria County. Pan American Production Co.'s A. H. Witte 1, Fernando de Leon Survey, flowed 12 million from Frio sand, Oligocene 5303-12 feet, open, completed 11-12-52, TD 7001.

TEXAS DISTRICT 3—NEW OIL FIELDS

Brazoria County, Danbury, North field. Ralph Lowe's J. M. Skrabanek 1, D. L. & C. Survey, flowed 259 barrels from Frio sand, Oligocene 7876-88 feet, 11/64-inch, 38.1-gravity, completed 11-16-52, TD 9655.

Galveston County, Gillock area. John W. Mecom's Maco Stewart 8-B, W. K. Wilson Survey, flowed 272 barrels from Frio sand, Oligocene 8780-84 feet, 9/64-inch, 42-gravity, TD 10,163.

Harris County. Oil & Chemical Products, Inc.'s Jessie A. Tucker 1, Section 30, Block 2, H&TC RR Co. Survey, flowed 128 barrels from Middle Yegua sand, Eocene 6788-90 feet, 1/8-inch, 39-gravity, completed 11-14-52, TD 7335.

Orange County, Echo area. Magnolia Petroleum Co.'s Lutcher & Moore G-1, Benjamin Johnson Survey, pumped 22 barrels oil and 12 barrels water from Frio sand, Oligocene 8722-27 feet, 36.7-gravity, completed 11-12-52, TD 9300.

Wharton County, North El Campo area. Progress Petroleum Co. of Texas' B. L. Franks 1, Section 17, I&GN RR Co. Survey, flowed 46 barrels from Frio sand, Oligocene 5793-95 feet, 12/64-inch, 33-gravity, completed 10-8-52, TD 6011.

TEXAS DISTRICT 3—NEW OIL PAYS

Colorado County, Sheridan field. Lone Star Production Co.'s Nora A. Ackley 1, W. L. Platt Survey, flowed 325 barrels from Wilcox A-5 sand, Eocene 8190-96 feet, ¼-inch, 36-gravity, completed 11-6-52, TD 9054.

Hardin County, Nona Mills field. General Crude Oil Co.'s Maude Parker, et al 1, A. Page Survey, ½-mile east of production, flowed 80 barrels from Yegua sand, Eocene 7066-70 feet, 1/8-inch, 36-gravity, completed 11-22-52, TD 8505.

Silsbee, North field. American Republics Corp. & Houston Oil Co.'s J. H. Kirby Fee 2, J. H. Kirby Survey, flowed 78 barrels from Yegua (7-C) sand, Eocene 7481-83 feet, 6/64-inch, 45.8-gravity, completed 11-5-52, TD 8000.

Sour Lake, North field. Sun Oil Co.'s Kiesling-Keith Unit 1, Isaac Bridge Survey No. 3, flowed 113 barrels from Yegua sand, Eocene 10,389-399 feet, 8/64-inch, 34.2-gravity, completed 11-11-52, TD 10,516.

Montgomery County, Risher field. C. W. (Chick) Hanslip's Hanrick & Rice 1, L. Y. Falsom Survey, flowed 42 barrels from Cockfield-Upper Yegua sand, Eocene 4655-57 feet, 5/64-inch, 35-gravity, completed 10-24-52, TD 5007.

TEXAS DISTRICT 3—OIL FIELD EXTENSIONS

Chambers County, Jackson Pasture, East field. Standard Oil Co. of Texas' Henry Gau, et al Unit 1, John S. Roberts Survey, ½-mile northwest extension, flowed

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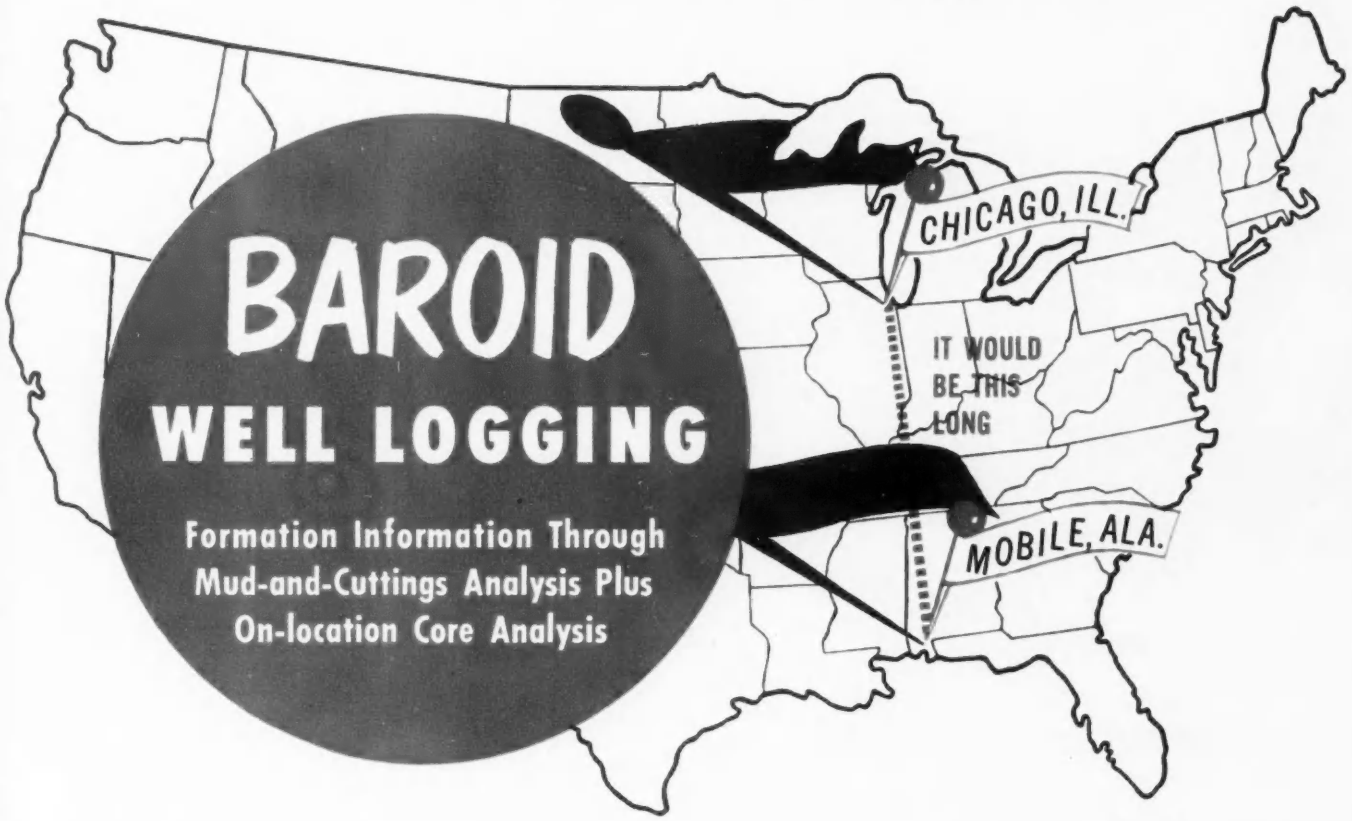

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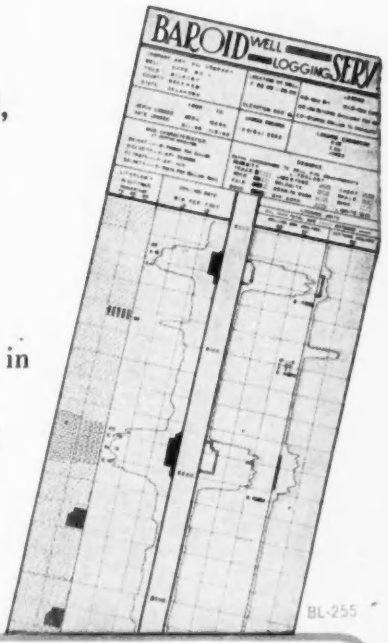

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131 barrels from Frio sand, Oligocene 8286-94 feet, 1/8-inch, 42.9-gravity, completed 11-7-52, TD 8500.

Fort Bend County, Fulshear field. Newton-Conroe Oil Corp.'s J. A. Bartlett 1, Alex Phillips Survey, ½-mile west extension, flowed 100 barrels from Yegua sand, Eocene 6862-70 feet, 9/64-inch, 41-gravity, completed 11-29-52, TD 7982.

Harris County, Decker's Prairie, South field. K. & H. Operating Co.'s Frank Harmeyer 1, Solomon Brown Survey, 1-mile south extension, flowed 133 barrels from Cockfield-Yegua sand, Eocene 5560-64 feet, 8/64-inch, 38.6-gravity, completed 11-26-52, TD 5775.

Katy, North field. Humble's E. G. Stockdick 1, Section 42, Block 1, H&TC RR Survey, south extension, flowed 89 barrels from Yegua sand, Eocene 6836-39 feet, 38.6-gravity, completed 11-25-52, TD 6901.

TEXAS DISTRICT 3—NEW DISTILLATE PAYS

Colorado County, Glasscock field. Sinclair's Schneider-Steiner Unit 1, B. J. Ijams Survey, flowed ungauged distillate and 4.8 million from Miocene sand, Miocene 2686-92 feet, open, completed 11-8-52, TD 3800.

Matagorda County, Lucky, South field. Commercial Petroleum & Transport Co.'s Marcus D. Huebner 1, Peter Bertrand Survey, southwest extension, flowed 208 barrels distillate and 16.5 million from Frio sand, Oligocene 9228-34 feet, open, 60-gravity, completed 11-18-52, TD 9537.

TEXAS DISTRICT 3—GAS FIELD EXTENSIONS

Colorado County, Englehart field. Michel T. Halbouty's Englehart Unit 1, J. Grant Survey, ¾-mile west extension, ungauged from Wilcox sand, Eocene 8796-8812 feet, completed 11-1-52, TD 8814.

Fort Bend County, Fulshear field. Union Producing Co.'s Liberto 1, John N. Ely Survey, ½-mile southwest extension, flowed 12 million from Cockfield sand, Eocene 6931-42 feet, open, completed 11-1-52, TD 7880.

TEXAS DISTRICT 4—NEW OIL FIELDS

Duval County. Edwin W. Pauley et al's Agnes Nelson Marshall et al 1, "La Huerta" Jose Antonio Gonzales Survey, flowed 107 barrels from Third Hockley sand, Eocene 6047-50 feet, ¼-inch, 44.1-gravity, completed 11-21-52, TD 6084.

Kenedy County. The Pure Oil Co.'s State of Texas Tract 284-1, Laguna Marde Tract 284, flowed 182 barrels from Frio sand, Oligocene 7486-7504 feet, 15/64-inch, 38.4-gravity, completed 11-15-52, TD 8712.

Nueces County. Phillips Petroleum Co.'s State Tract 750-1, Nueces Bay Tract 750, flowed 132 barrels from Sinton sand, Oligocene 5973-78 feet, 9/64-inch, 42.2-gravity, completed 11-12-52, TD 9000.

San Patricio County. Republic Natural Gas Corp. & Union Oil of California's J. H. Ewing C-1, George H. Paul Subdivision of Coleman-Fulton Pasture Co. Lands, Section 13, Block 8, flowed 113 barrels from Oligocene sand 6930-35 feet, 1/8-inch, 38.8-gravity, completed 10-26-52, TD 7150.

Starr County. Magnolia Petroleum Co.'s W. T. Neblett 1, Subdivision E, Share 4, El Benadito Grant, flowed 60 barrels from Zanarine (Frio) sand, Oligocene 5384-86 feet, 6/64-inch, 49-gravity, completed 11-15-52, TD 6000.

Webb County. Laurel Petroleum Co.'s Laurel Unit 1-A, Survey 1100, flowed 19 barrels from Yegua-Cockfield sand, Eocene 2209-15 feet, 49-gravity, completed 11-3-52, TD 2255.

TEXAS DISTRICT 4—NEW OIL PAYS

Aransas County, Salt Lake field. Sun Oil Co.'s State Tract 104-2, Subdivision of Copano Bay Tract 104, flowed 148 barrels from K-7 sand, Oligocene 8550-56 feet, 42-gravity, completed 11-12-52, TD 8600.

Hidalgo County, Tabasco field. George H. Coates' Salomon Chapa 1, Portion 74, Share 3-B, flowed 150 barrels from Heard sand, Oligocene 6272-85 feet, 8/64-inch, 46.1-gravity, completed 11-5-52, TD 7162.

San Patricio County, Harvey field. La Gloria Corp.'s August Guettler et al 3, George Sargent Rincon Rodd Subdivision, Block 7, flowed 126 barrels from Frio (14-B-3) sand, Oligocene 8910-30 feet, 3/16-inch, 42.3-gravity, completed 11-18-52, TD 9460.

TEXAS DISTRICT 4—NEW GAS FIELDS

Duval County. Appell Drilling Co. & George W. Lyles' Lucille Gruy Est 2, M. E. Gussett Survey 394, flowed 2.2 million from Mirando sand, Eocene 2668-70 feet, open, completed 10-31-52, TD 4015.

Kenedy County. Delhi Oil Corp.'s Delhi-Atlantic McGill Ranch 1, "Santa Rosa de Arriba" Pedro de la Garza Grant,

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BRINGS IN JUNK!

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Circulating fluid is diverted through side passages in the barrel and against the full circumference of the hole. Here the fluid is deflected, moving all objects toward center. Fluid flows in a continuous stream to the center of the tool and up through the barrel to return ports pulling all objects through the catcher. This reverse circulation action assures more complete recovery of junk in the hole and eliminates misruns. *Full pump pressure can be utilized* because there's no danger of pressure bearing against and causing loss of the fish.

Comes in sizes from 3¾" to 17½" and is engineered to recover all types of bit cones used to drill hole sizes within its range.

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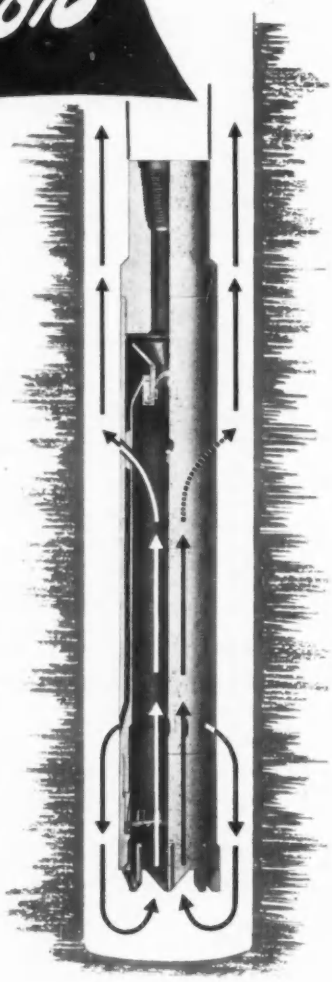

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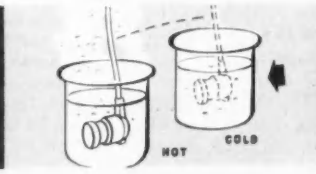

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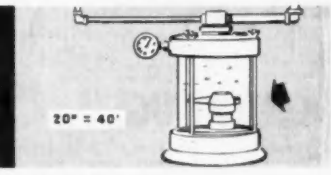

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flowed 4.5 million from Holmes (Frio) sand, Oligocene 7597-7606 feet, completed 11-18-52, TD 8350.

Zapata County, Northeast Lopena area. Standard of Texas' I. Ramirez 1, Jose C. Ramirez Porcion 18, ungauged, completed 10-30-52, TD 12,349.

TEXAS DISTRICT 4—NEW GAS PAY

Hidalgo County, Pharr field. Taylor Oil and Gas Co. & Mayfair Minerals' Bessie Bond 1, San Juan Hacienda East Unit No. 1, Block 13, Closner Subdivision, Portion 71, ungauged from Lower Marks sand, Oligocene 10,460-660 feet, completed 11-18-52, TD 11,180.

TEXAS DISTRICT 4—GAS FIELD EXTENSION

Jim Wells County, Orange Grove field. H. R. Smith's E. R. Ahrens 1, Gulf Coast Farming & Trucking Subdivision, Block 8, ungauged from Frio sand, Oligocene 5048-60 feet, completed 11-1-52, TD 5670.

TEXAS DISTRICT 6—NEW OIL FIELD

Wood County. L. A. Grelling's Mary Saner 1, Mary Polk Survey, pumped 172 barrels from Woodbine sand, Upper Cretaceous 5348-52 feet, 19-gravity, completed 11-11-52, TD 6070.

TEXAS DISTRICT 7-C—NEW OIL FIELDS

Runnels County. George W. Strake's Charity C. Pace 1, L. Forsythe Survey No. 450, flowed 230 barrels from Fry sand, Pennsylvanian 4458-66 feet, ½-inch, 42.4-gravity, completed 11-17-52, TD 5187.

Unnamed field. George W. Strake's Jessie Boothe 1, Tract 17, Norvell Travis Survey No. 533, flowed 18 barrels from Gardner sand, Pennsylvanian 3865-70 feet, 16/64-inch, 41.5-gravity, completed 9-19-52, TD 4196.

TEXAS DISTRICT 7-C—NEW OIL PAY

Upton County, Pegasus-Ellenburger field. Wilshire Oil Co.'s Mrs. W. R. Timmins et al 1-12, Section 12, Block 41, T5S, T&P Survey, flowed 314 barrels from Wolfcamp lime, Permian 9912-76 and 9990-10, 134 feet, ¾-inch, 42.4-gravity, completed 11-21-52, TD 13,587.

TEXAS DISTRICT 7-C—OIL FIELD EXTENSION

Schleicher County, Hulldale-Pennsylvanian field. Sinclair's Dwight McClatchy 1, Section 31, Block M, GH&SA Survey, 1-mile south extension, flowed 1623 barrels from Reef lime, Pennsylvanian 5630-40 feet, ½-inch, 41.5-gravity, completed 11-29-52, TD 5675.

TEXAS DISTRICT 8—NEW OIL FIELDS

Andrews County. Frank and George Frankel's University Q-1, Section 47, Block 13, University Lands Survey, flowed 6 barrels fom Yates sand, Permian 2943-3175 feet, 22/64-inch, 38.7-gravity, completed 11-19-52, TD 3175.

Unnamed field. Magnolia Petroleum Co.'s Fasken Block "EA" 1, Section 12, Block 42, T2N, G&MMB&A Survey, flowed 366 barrels oil and 11 barrels water from Wolfcamp lime, Permian 8430-50 and 8460-90 feet, 36/64-inch, 39-gravity, completed 11-29-52, TD 9143.

Unnamed field. The Texas Co.'s State of Texas "AB" 1, Section 22, Block 5, University Lands Survey, pumped 133 barrels from Devonian lime, Devonian 12,592-614 feet, 41.6-gravity, completed 11-11-52, TD 12,667.

TEXAS DISTRICT 8—NEW OIL FIELDS

Ector County. J. D. Wrather, Jr.'s G. T. Hall et al 1, Section 7, Block B-15, PSL Survey, flowed 173 barrels from Fusselman lime, Silurian 9830-65 feet, 24/64-inch, 42.6-gravity, completed 10-30-52, TD 11,099.

Garza County. Duncan Drilling Co.'s Davis 1, Section 80, Block 5, GH&H Survey, pumped 22 barrels from Clearfork lime, Permian 2741-2825 feet, 39-gravity, completed 11-15-52, TD 2825.

Howard County. Pan American Production Co.'s Pauline Hamlin 1, Section 43, Block 32, T3N, T&P Survey, flowed 312 barrels from Canyon Reef lime, Pennsylvanian 8160-87 feet, 20/64-inch, 47-gravity, completed 11-21-52, TD 8324.

Pecos County. Standard of Texas' Owens 1-A, Section 2, Block C-4, GC&SF Survey, pumped 106 barrels oil and 5 barrels water from Ellenburger lime, Ordovician 9705-60 feet, 36.6-gravity, completed 8-14-52, TD 9990.

Yoakum County. Amerada Petroleum Co.'s L. R. Weems et al 1, Section 403, Block D, John H. Gibson Survey, flowed 1935 barrels from Devonian lime, Devonian 11,773-860 feet, ¾-inch, 43.4-gravity, completed 11-5-52, TD 11,860.

TEXAS DISTRICT 8—NEW OIL PAYS

Andrews County, Block 11 field. Superior Oil Co.'s University 11-C 2, Section 27, Block 11, University Lands Survey, flowed 283 barrels from Wolfcamp lime, Permian 7950-62 feet, 16/64-inch, 43.6-gravity, completed 11-26-52, TD 8548.

Ector County, Donnelly field. Eastland Oil Co.'s J. L. Johnson, Jr. 28, Section 42, Block 43, T1S T&P Survey, pumped 55 barrels oil and 2 barrels water from Tubb lime, Permian 5599-5708 feet, 30-gravity, completed 11-9-52, TD 5908.

TEXAS DISTRICT 8—OIL FIELD EXTENSIONS

Andrews County, Block 11-Devonian field. Group Oil Co.'s University 1, Section 28, Block 11, University Lands Survey, 1-mile south extension, flowed 300 barrels from Devonian lime, Devonian 8160-8220 feet, ⅜-inch, 41.7-gravity, completed 11-20-52, TD 8250.

Howard County, Coronet field. Haynes & V-T Drilling Co.'s Chester Jones 1, Section 15, Block 26, H&TC Survey, 1⅛-mile south extension, pumped 118 barrels from Coronet lime, Permian 2852-79 feet, 22-gravity, completed 10-25-52, TD 2879.

UTAH—NEW OIL FIELD

Duchesne County, West Pleasant Valley area. Deep Well Production, Inc.'s Lambert-Government 1, SW SW 22-8s-16e, pumped 10 barrels from Basal Green River lime, Eocene 6022-26, 6146-52 and 6200-10 feet, completed 11-25-52, TD 7140.

UTAH—NEW GAS PAY

Carbon County, Gordon Creek field. Pacific Western Oil Corp.'s Unit 3 W/2, NE NW 19-14s-8e, flowed 1.5 million from Ferron sand, Upper Cretaceous 3418-3516 feet, completed 11-20-52, TD 4358.

WYOMING—NEW OIL FIELD

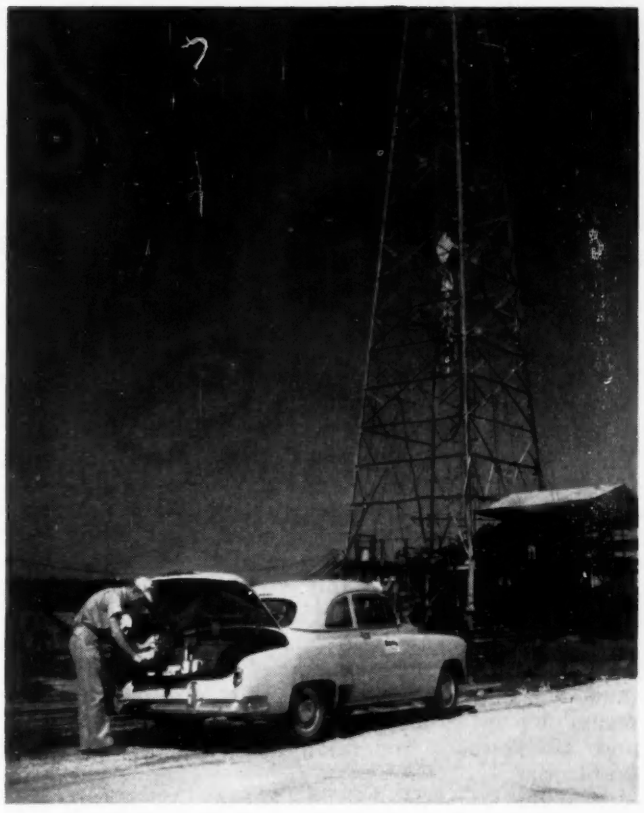
Park County. Crude Oil Prod.-George & Wrather-W. F. Lacy's State 1, SW SE 36-44n-65w, pumped 60 barrels from Newcastle lime, Upper Cretaceous 5832-80 feet, completed 10-31-52, TD 5880.

How to Train Mud Engineers

Here's a simple answer to a problem that's a step in the process of preparing for a $1 million responsibility.

PART 1

By FRED CHISHOLM and B. Q. GREEN
Magnet Cove Barium Corporation, Houston



Training the drilling engineer is no simple chore. The program must be developed to a point where the mud engineer is equipped with adequate knowledge and tools to find solutions to both drilling and mud problems. Here, the mud engineer conducts tests on drilling fluid in the portable, yet complete laboratory, rigged in the back of a car.

EDITOR'S NOTE—Only a minority of rotary rig operators are not interested in some phase of drilling fluid testing procedure. All deep well rigs are operated and supervised by men who must be acquainted with these basic test procedure facts. Surprising but true, over 10,000 men are vitally interested in drilling mud control, the basic premise of which is decent test procedure. In this light, WORLD OIL is publishing this material as a service to the contractor, superintendent, toolpusher, engineer, driller and derrick man, who are directly or indirectly assigned the responsibility of mud control.

DRILLING MUD IS rapidly becoming known as one of the most important tools used to drill deeper horizons in the search for oil. The technology of drilling mud, which had an humble beginning at Spindletop in 1901, today has developed into a science requiring the skilled hands of technically trained personnel to apply the modern techniques of drilling mud control. With the science of mud engineering has come the mud engineer, the individual who is charged with the responsibility of making certain that the drilling fluid meets all qualifications to perform its vital functions efficiently.

Drilling mud has many functions. It cools and lubricates the drill bit as it grinds into the earth. It keeps the bottom of the hole clear of cuttings and carries them to the surface. Mud forms a protective wall against the side of the hole to guard against cave-ins and to block off troublesome formations. By its own weight it must withstand the enormous pressures of gas or salt water flows oftentimes encountered by the drill bit. The comprehension of these functions of the mud and the basic knowledge of the procedures of drilling mud control rest squarely upon the shoulders of the mud engineer. With a clear idea of the task the mud is to perform, the mud engineer will synthesize a mud with the chemical and physical properties required to successfully drill a specific location.

As the drilling mud is constantly circulated through the drill pipe and returns to the surface, the mud engineer, with an experienced eye and delicate instruments, can tell the story of what is happening at the bottom of the bore hole. He must evaluate the physical and chemical changes of clay and water suspensions in terms of chemical treatment and complex reactions, involving such things as base exchange, hydration or dehydration. For these reasons and many others, mud engineering has become a unique and highly skilled profession.

The efficient performance of mud is vital to economical and effective well drilling. The mud cost on a well may vary from a few hundred dollars to more than $150,000. An economical mud program is often the reward for proper drilling mud control. With the development of highly specialized muds, proper drilling mud control is also essential in obtaining maximum protection to the well bore and formations opened by the bore hole.

In recent years, the producing companies have come to recognize that decreased costs can be realized through increased education on the subject of drilling fluids. To meet the need for technically trained personnel to handle mud problems, the petroleum industry has been forced to institute training programs on the principles of drilling mud control. Few schools offering petroleum engineering include instruction in mud as part of their curriculum, leaving industry with little alternative other than to train their own men. Mud

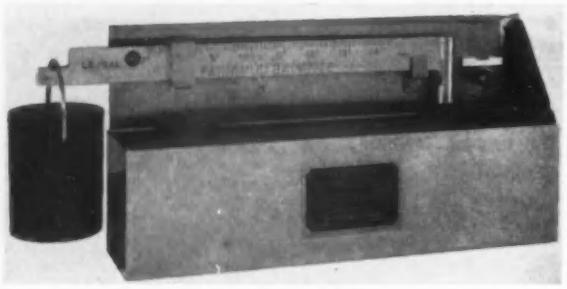


FIGURE 1. Fann mud balance.

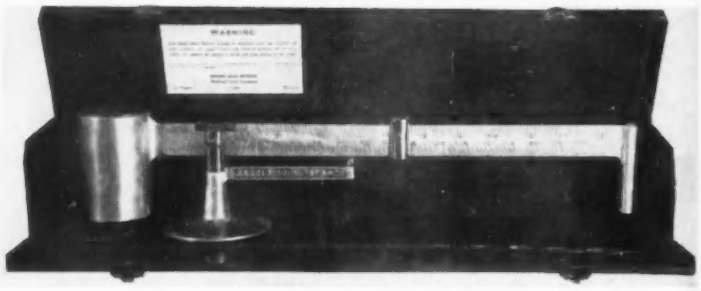


FIGURE 2. Baroid mud balance.

service companies have for many years conducted extensive training programs in mud engineering. Usually, men with petroleum or chemical engineering backgrounds are hired and taught the fundamentals of mud engineering in a course of study which in general includes instrumentation and testing procedures, chemistry of clay and clay suspensions, mud products, the physical and chemical properties of mud, types of commonly used muds, techniques in drilling mud control and special muds and finally, mud problems.

It is the intent here to emphasize the importance of the technology of mud and to present Experiment 1 from a typical mud training program, which describes to the hopeful mud engineering trainee, the instruments which have been developed to measure the physical properties of mud and analytical procedures adopted to measure the chemical properties of mud.

Experiment 1

STANDARD PROCEDURE FOR TESTING DRILLING FLUIDS

Purpose: To study the testing equipment and procedures for testing the physical and chemical properties of drilling mud and become proficient in performing these tests. Each piece of this equipment may be treated as a separate experiment, and should be thoroughly mastered at this time. What they test, as well as the limitations of each piece of apparatus, should be discussed and understood.

Apparatus and Materials: Fann mud balance; Baroid mud balance; Marsh funnel; Stormer viscosimeter; Fann V-G meter—laboratory model; Fann V-G meter—field model; Fann filter press—field model; Fann filter press—laboratory model; Baroid filter press; pHydrion paper; Beckman pH meter; sand content set; three muds representative of low, medium and high weight, and various apparatus and materials for conducting chemical tests.

Section 1

DENSITY OR MUD WEIGHT

Instruments: The density or weight of the mud may be determined by the use of any instrument of sufficient accuracy to permit measurement to within one-tenth pound per gallon (one-half pound per cubic foot). For all practical purposes, density means weight per unit of volume, and making a density test means weighing the

FIGURE 3 (above). Marsh funnel and mud cup.

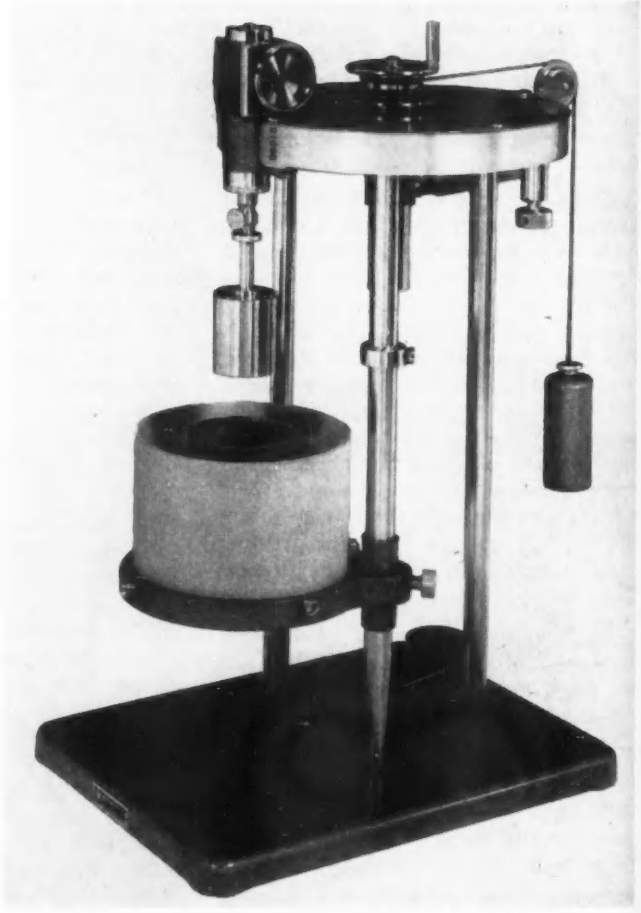


FIGURE 4 (right). Stormer viscosimeter.

mud. The instrument should be calibrated with water at least once a week.

Fann Mud Balance

A. Description:

The Fann mud balance (Figure 1) consists principally of a graduated arm, molded hard rubber cup and cap, mounted on a specially hardened knife edge, rigidly attached to a stainless steel carrying case, 3½ x 3½ x 12¾ inches; equipped with a level vial, rider and counter weight. The constant-volume molded hard rubber cup and cap are not affected by chemicals found in any drilling fluid. The cup is detachable for filling, and, since it hangs by a knife edge, is extremely sensitive. The beam is protected from the wind and unnecessary handling. The cup and arm oscillate in a plane perpendicular to the knife edges and are balanced by moving the rider along the arm.

B. Calibration:

Place the stainless steel carrying case with the back to the wind, and with the bubble in the level vial centered.

Remove lid from cup, and completely fill cup with water.

Replace the lid and wipe dry.

With the beam on the knife edge, suspend the cup from the notch of the beam.

The horizontal line on the beam should be level with the indicator, when the rider is set on 8.33. If not, add to, or remove shot from the well in the end of the beam.

C. Procedure:

Remove the cup from the beam, the lid from the cup, and completely fill the cup with the mud to be tested.

Replace the lid with a rotary motion, and press down firmly, making sure some mud is expelled through the hole in the lid.

Wash or wipe the cup clean.

Replace the mud cup on the beam, so that the knife edge rests in the notch near the end of the beam.

Move the rider until the horizontal line on the beam is level with the indicator.

At the left-hand edge of the rider, read the density or weight of the mud.

Report the result to the nearest scale division, either in pounds per gallon or pounds per cubic foot.

Baroid Mud Balance

A. Description: The Baroid mud balance (Figure 2) consists principally of a base on which rests a graduated arm with cup, lid, knife edge, level vial, rider and counterweight. The constant-volume cup is affixed to one end of the graduated arm, which has a counterweight on the other end. The cup and arm oscillate in a plane perpendicular to the horizontal knife edge, which rests on the support, and are balanced by moving the rider along the arm.

B. Calibration:

Remove the lid from the cup, and completely fill the cup with water.

Replace the lid and wipe dry.

Replace the balance arm on the base, with the knife edge resting on the fulcrum.

The level vial should be centered when the rider is set on 8.33. If not, add to, or remove shot from the well in the end of the beam.

C. Procedure:

Remove the lid from the cup, and completely fill the cup with the mud to be tested.

Replace the lid and rotate until firmly seated, making sure some mud is expelled through the hole in the cup.

Wash or wipe the mud from the outside of the cup.

Place the balance arm on the base, with the knife edge resting on the fulcrum.

Move the rider until the graduated arm is level, as indicated by the level vial on the beam.

At the left-hand edge of the rider, read the density or weight of the mud.

Report the result to the nearest scale division, either in pounds per gallon or pounds per cubic foot.

Section 2

Viscosity

Instruments: The Marsh funnel viscosimeter is used for the routine field measurement of viscosity of drilling mud. The Stormer viscosimeter is used to supplement the information obtained from the Marsh funnel, particularly with respect to the gel characteristics of the mud. Another recent development in this field is the Fann V-G meter for measuring viscosity and gel strength.

Marsh Funnel

A. Description: The Marsh funnel (Figure 3) is six inches in diameter at the top, and 12 inches long. At the bottom, a smooth-bore tube two inches long, having an inside diameter of 3/16 inch, is attached in such a way that there is no constriction at the joint. A wire screen, having 1/16-inch openings, covering one-half of the funnel, is fixed at a level of ¾ inch below the top of the funnel.

B. Calibration:

Fill the funnel to the bottom of the screen (1500 milliliters) with water at 70° Fahrenheit plus or minus 5° F. Time of outflow of one quart (946 ml.) should be 26 seconds plus or minus ½ second.

C. Procedure:

With the funnel in an upright position, cover the orifice with a finger and pour the freshly collected mud sample through the screen into the clean, dry funnel until the fluid level reaches the bottom of the screen (1500 ml).

Immediately remove the finger from the outlet and measure the

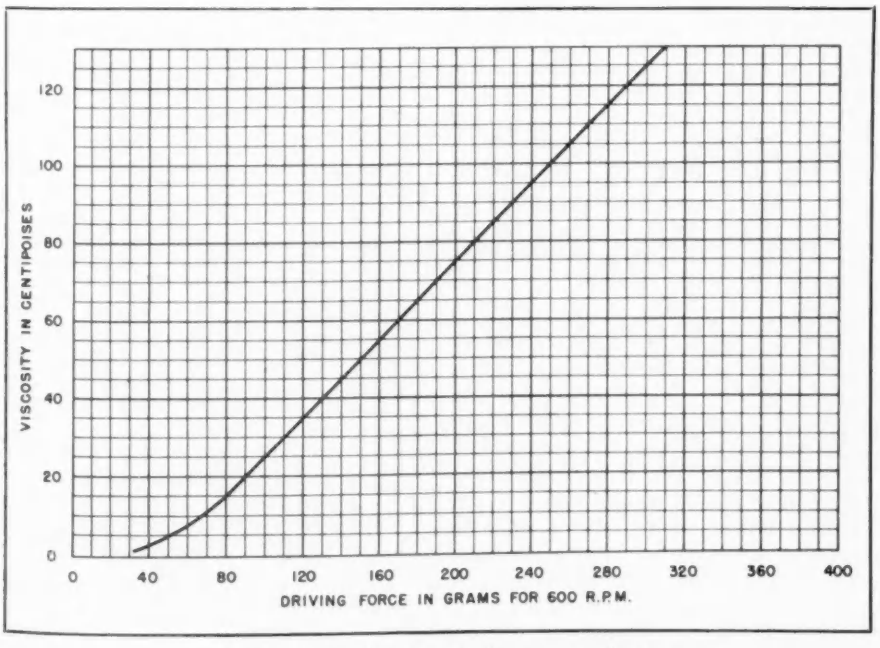


FIGURE 5. Calibration curve for Stormer viscosimeter.

time required for the mud to fill the receiving vessel to the 1-quart (946 ml) level.

Report the result to the nearest second as Marsh funnel viscosity, at the temperature of measurement in degrees Fahrenheit.

STORMER VISCOSIMETER

A. Description: The Stormer viscosimeter (Figure 4) consists essentially of a spindle which is rotated in a test cup by a set of gears driven by a falling weight. The rotation of the spindle is indicated by a revolution counter. The rotor is 1¼ inches in diameter and 1⅜ inches long. In the top of the cylinder are four 3/16 inch holes. The test cup is 2½ inches deep, has an internal diameter of 1⅞ inches, and is fitted with two vanes or baffles, set opposite each other. The vanes are 1 15/16 inches long, and extend toward the center of the cup, a distance of ½ inch, leaving a clearance of 1/16 inch between the vane and the rotor. A calibration curve for the instrument is prepared by determining the driving weight necessary to turn the spindle at the rate of 600 revolutions per minute in liquids of known viscosity, e. g., solutions of glycerine or sucrose of specified composition, data on which are available in chemical handbooks.

B. Procedure for viscosity determination:

Fill the cup to within ¼ inch of the top with the mud to be tested. If the mud contains coarse material, remove this by passing the mud through a 20-mesh screen.

Place the cup in the water bath and move the assembly upward on the support rods as far as it will go and secure the cup by fastening the set screw.

Attach such weights to the line as are estimated to be necessary to produce a rate of rotation 600 rpm. Release the brake and agitate the mud by turning the reel. While the spindle is rotating, release the reel when the pointer is approximately 15 to 25 units to the right of the zero mark. Start the stopwatch when the pointer passes the zero mark, and stop it when the pointer again passes zero, thus registering the time of 100 revolutions. Adjust the weights on the line so that 100 revolutions are made in exactly 10 seconds.

From the calibration chart for the instrument (Figure 5) read the viscosity, in centipoises, corresponding to the driving weight employed.

Report the result, in centipoises, as Stormer viscosity, at 600 rpm, at the temperature of measurement, in degrees Fahrenheit.

C. Procedure for gel strength determination:

Initial gel strength: Agitate the suspension in the cup by rapidly rotating the spindle for several seconds. Immediately after agitation, add weights to the line until a pronounced initial movement of the spindle is observed (⅛ turn). After each addition of the weight, release the brake, and if there is no movement of the spindle, agitate the mud again and add more weight to the line until the initial movement of the spindle is observed. Record the gel strength at zero time as the initial gel strength. (Note: The gel strength of a thixotropic material increases rapidly during the first few seconds after agitation. Obtain the reading as soon as possible after agitating the sample.)

Ten-minute gel strength. Agitate the suspension as before, by rapidly rotating the spindle. Let the suspension set for ten minutes. (NOTE: The sample must not be disturbed by the slightest vibration during the test.) Add weight to the line in increments of five grams, until the initial movement of the spindle is observed. In making this

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He was graduated from Hardin-Simmons University in 1936 with a BS degree. After teaching science in a West Texas high school for one year he became associated with Magnolia Petroleum Company in Beaumont, as a chemist. In 1944 he was employed by Magnet Cove at its Arkansas barite plant as chemist and metallurgist. In 1947 he was transferred to the company's Houston Office, where he is Manager of The Service Laboratory.

B. Q. GREEN is Engineer Training Supervisor, Magnet Cove Barium Corporation.

He was graduated from the University of Texas in 1927 and took postgraduate work in summer school in 1933, 1935 and 1938. He taught chemistry in the Houston Public School System from 1930 to 1945. He did chemical research for the National Instrument Company, building binoculars for the government in 1944 and 1945, joining Magnet Cove Barium Corporation in June, 1945.

FIGURE 6. Fann V-G meter, laboratory model.

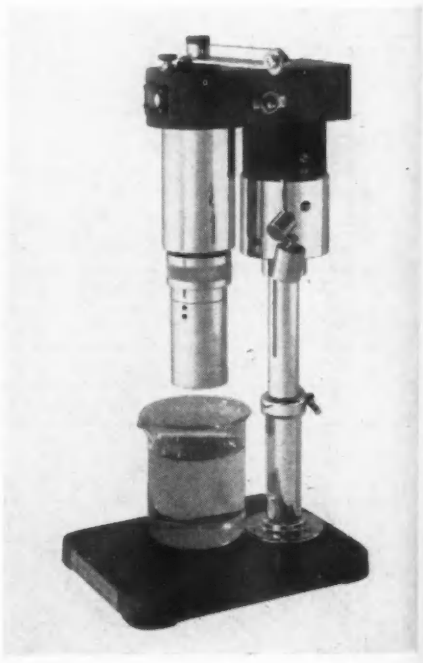

FIGURE 7. Fann V-G meter, field model.

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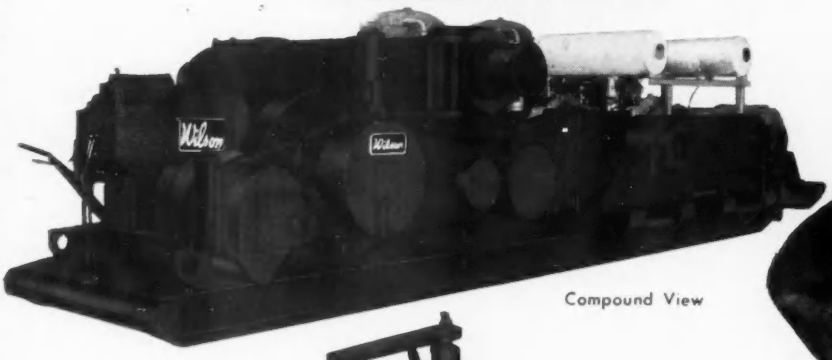

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determination, the brake must be off only for a few seconds required to observe whether there is any motion of the spindle. If the brake is off while weights are being added, the gel will be broken by the spindle movement and the reading obtained for the gel strength will be false.

Fann V-G Meter, Laboratory Model

A. Description: The Fann V-G meter, laboratory model (Figure 6) is operated by a 110-volt synchronous motor. The motor and rotor assembly are stationary, and connected by a v-belt over properly sized pulleys. The work table is movable and made rigid by a set screw attached to the upright support of the instrument. The power turns a torque sleeve 1.55 inches o.d., 1.45 inch i.d. around an inner measuring bob 1.35 inches in diameter and 1.50 inches long, with a clearance between the sleeve and bob of 0.05 inch. This construction practically eliminates turbulent flow in the viscosities normally found in drilling mud at the speeds indicated by this instrument. A graph (Figure 8) in which viscosity is plotted against the balancing force in grams results in straight lines at all speeds.

B. Procedure for viscosity determination:

Connect instrument to proper current source (110-volt, 60 cycle, alternating current only).

Swing weight arm to preferred operating position, and be sure that line is wrapped one turn only, counterclockwise, around central shaft. Line is attached to shaft by slipping knotted end through saw slot at top of shaft. The outer rotor should be pushed up firmly in its socket, and should run without appreciable wobble when motor is turned on.

Place sample in suitable container and immerse rotor to scribed mark by loosening set screw and raising work table. (350 cubic centimeters of fluid in a 500-cc enamel cup works nicely.)

Turn motor on speed desired and let run until sample is thoroughly agitated.

Attach a sufficient number of metric weights to line to bring indicator (inside window, top front) to center mark. At 600 rpm, divide weight in grams necessary to achieve this balance by two, to obtain viscosity in centipoises. At 300 rpm, weight in grams equals viscosity in centipoises.

C. Procedure for gel strength determination:

Initial gel strength: With motor running at 600 rpm, estimate weight required and attach to line. This weight will in all cases be less than enough to balance instrument, such as in a viscosity determination. Indicator will move to the extreme left as sample is stirred. Turn off motor. The least amount of weight required to move the indicator to the center mark is recorded as the initial gel strength.

Ten-minute gel strength: Proceed as above, but with motor on, and the indicator displaced to the left, apply brake by turning small knurled knob at top front of instrument. Turn motor off and attach the estimated weight required. After desired time has elapsed, release brake to see if proper weight has been selected. If additional weight must be added, always reset brake before touching line. The least amount of weight required to move the indicator to the center mark is recorded as the ten-minute gel strength.

D. Care of instrument: Clean entire rotor assembly thoroughly. Remove outer rotor by twisting gently while pulling downward. This part should be washed and dried each time it is used. The inner (stationary) cylinder may be cleaned with a damp cloth without removing it from tapered shaft.

Fann V-G Meter, Field Model

A. Description: The Fann V-G meter, field model (Figure 7) is operated by a six-volt direct current automobile storage battery. The motor and rotor assembly are rigidly connected and may be adjusted to the proper height from the stationary work table by means of a telescoping tube and set screw. The rotor assembly is identical with the laboratory model described above.

B. Procedure for viscosity determination:

Connect instrument to proper current source (six-volt storage battery).

Swing weight arm to preferred operation position, and be sure that line is wrapped one turn only, counterclockwise, around central shaft. Line is attached to shaft by slipping knotted end through saw slot at top of shaft. The outer rotor should be pushed up firmly in its socket, and should run without appreciable wobble when motor is turned on.

Place sample in suitable container and immerse rotor to scribed mark by loosening set screw and lowering instrument head. (350 cc of fluid in a 500-cc enamel cup works nicely.)

Turn on motor and agitate sample thoroughly by pressing high-speed switch button on left side of instrument.

Attach a sufficient number of metric weights to line to bring indicator (inside window, top front) to center mark. Divide weight in grams necessary to achieve this balance by two, to obtain viscosity in centipoises.

C. Procedure for gel strength determination:

Initial gel strength: Same as with laboratory model.

Ten-minute gel strength: Same as with laboratory model.

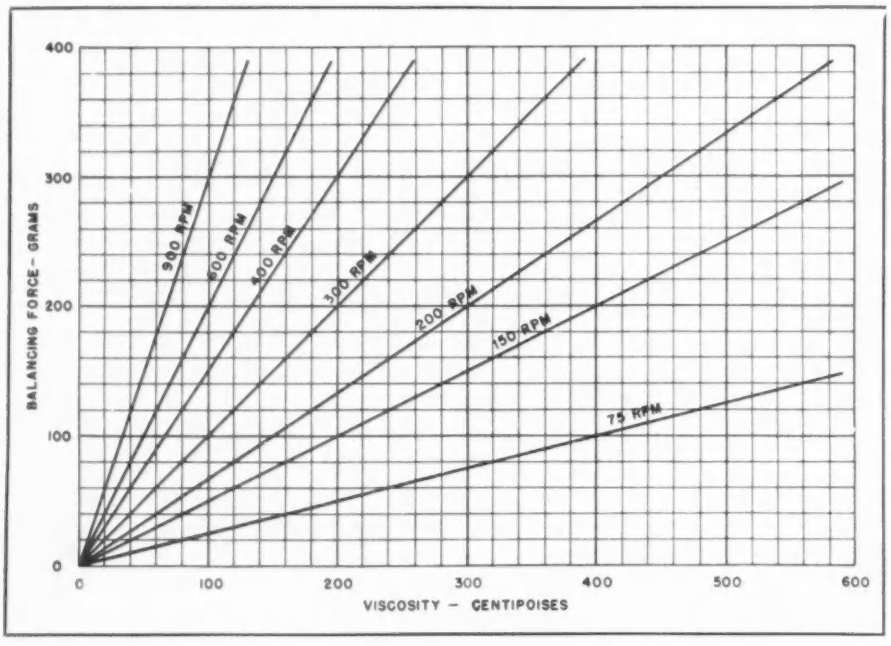
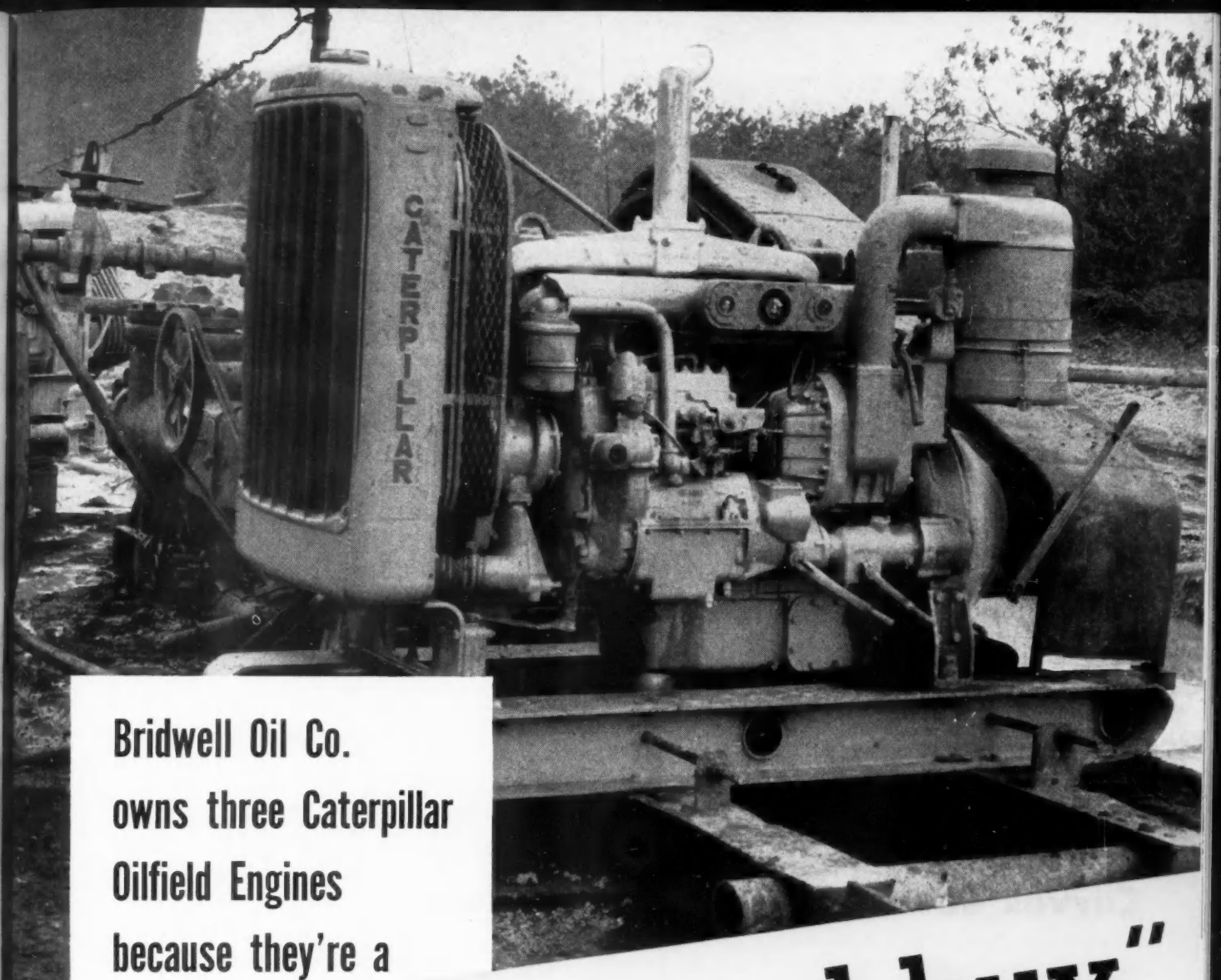


FIGURE 8.

(First of Two Parts)



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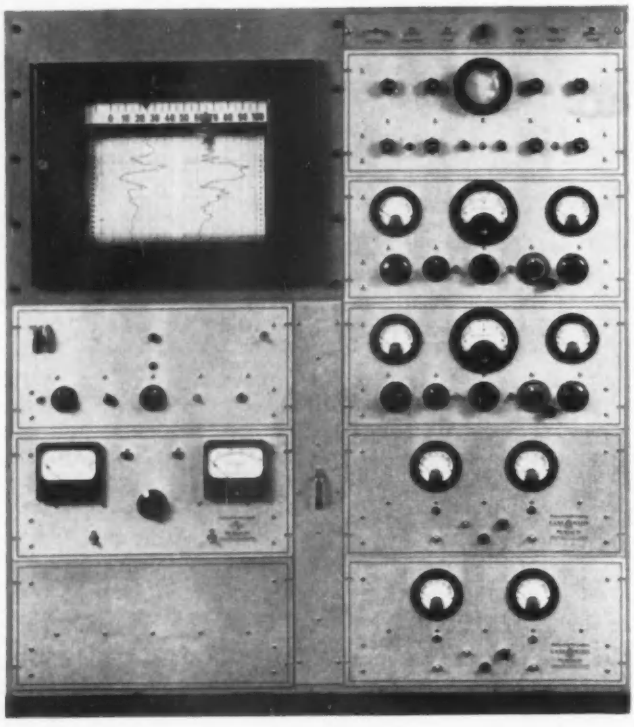


Dual electronic recorder mounted on control panel in instrument truck.

Operator at logging console in instrument truck.

Simultaneous Log of Radioactivity Curves Cuts Standby Time in Half

- **New technique affords substantial savings.**
- **Crews serve more wells in given period of time.**

By GILBERT SWIFT, Well Surveys, Inc., Tulsa,
and **C. C. ROBERTS,** Minneapolis-Honeywell Regulator Company, Philadelphia

INSTRUMENTATION DEVELOPMENT which permits logging gamma-ray and neutron curves simultaneously makes it possible to cut down standby time in half and results in considerable savings to the operator. Heretofore, while a radioactivity well log was being taken for both curves it was necessary to make two separate trips. Made one at a time the two curves logged throughout a 12,000-foot well, require from 7 to 20 hours operating time. Meanwhile, drilling crews and equipment necessarily stand idle. This new development also makes it possible for logging crew and equipment to serve more wells in a given period of time.

The most obvious method of reducing logging time without impairing accuracy or quality of results, is to log both the gamma-ray and neutron curves simultaneously during one traverse of the well, thereby cutting operating time in half. Through the use of a two-pen dual recorder, a newly designed subsurface device, and the necessary auxiliary circuits and equipment, simultaneous recording of the two curves is accomplished. The use of this two-pen dual recorder permits both curves to be recorded on the same instrument chart with the result that depth discrepancies between curves are wholly eliminated.

POWER TO ELECTRICAL EQUIPMENT IN BOREHOLE SUPPLIED FROM SURFACE. The complete logging equipment (Figure 1) comprises a hoist truck of conventional design, a specially designed instrument truck, and the subsurface instrumentation. With the arrangement shown, power to the electrical equipment for the subsurface instrument in the borehole is supplied from the surface. This eliminates the problem of frequent battery deple-

tion in the subsurface instrument and minimizes instrument maintenance.

As shown in Figure 2, the subsurface instrument is divided into two separable sections. The lower section produces the neutron curve and the upper section, the gamma-ray curve. A magnetic casing collar locator incorporated in the upper section furnishes an indication of each casing joint as it is passed and thus ties the radioactivity curves to permanent depth markers. To prevent interference between the neutron source and gamma-ray detector, adequate shielding and separation are provided. Coupled together, the two sections form a single rigid subsurface assembly.

To facilitate coupling of the two sections, particularly when only limited overhead distance is available, a tong-like clamp is provided. This permits the bottom section of the subsurface instrument to be lowered into the well before the upper section is attached. Once the coupling has been made, the clamp is removed and the complete assembly is lowered rapidly to the bottom of the well. The log is recorded during the upward trip so as to insure cable tension and accurate depth registration.

TWO GAMMA-RAY DETECTING ELEMENTS EMPLOYED. Incorporated in the subsurface instrument are two high-pressure ionization chambers which function as gamma-ray detecting elements. The upper element evaluates the intensity of natural radioactive radiation emitted from the various rocks surrounding the well hole. The lower detecting element reacts to gamma-rays liberated in the rock as a result of neutron bombardment. Neutron bombardment of the surrounding rock formation is produced by a neutron source located in the bottom portion of the subsurface assembly.

The source comprises a small capsule of radioactive material which produces a constant flux of fast neutrons by the bombardment of alpha particles on beryllium. The detecting element employed for the neutron curve measurements is sufficiently smaller and less sensitive than the one used for the gamma-ray curve, to provide measurements of the neutron induced radiation without interference from the weaker natural radiation.

Functionally, the gamma-ray curve, produced by moving the ion chamber detecting element up the borehole, serves to locate the exact position and thickness of each formation and to differentiate between the various types of rock material. Distinctive features of the gamma-ray curve permit correlation from well to well over great distances.

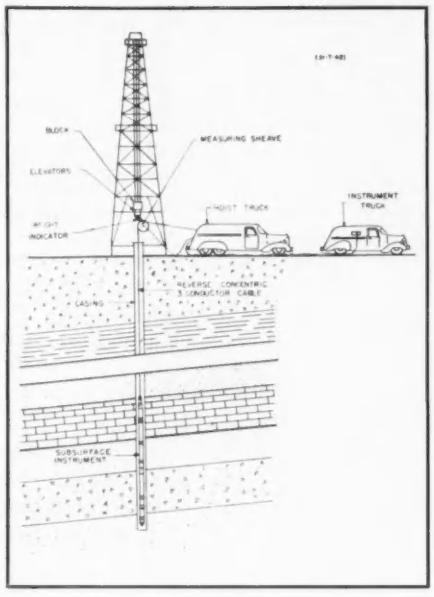


FIGURE 1.

Diagrammatic representation of complete equipment necessary for obtaining simultaneous log of radioactivity curves.

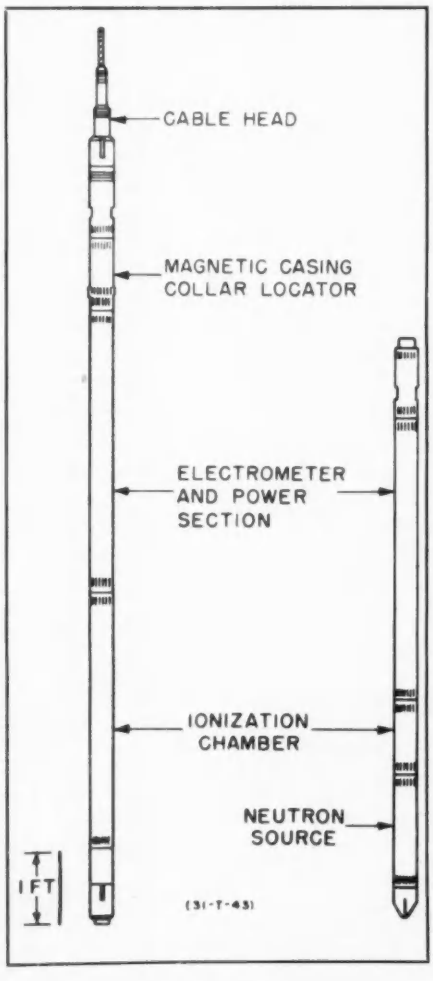


FIGURE 2.

Subsurface instrument for obtaining simultaneous log of radioactivity curves. Bottom section on right.

The neutron curve, provided by ion chamber measurements of the effect of neutron bombardment, serves as a measure of the amount of fluid in the rocks. As the neutron source is moved progressively up the borehole, the induced gamma-radiation measured by the lower ion chamber is influenced principally by the amount of hydrogen in the surrounding area. This is a function of the fluid content of the rocks.

The response to variations of fluid-filled porosity is sufficiently consistent in many limestone reservoirs to permit quantitative determination of porosity directly from the neutron curve. In practice, the numerical relationship between neutron curve response and porosity is established from one or more wells where porosities have been determined from core data, and then applied to the neutron curves of other wells in the field.

NULL BALANCE SYSTEMS EVALUATE RADIATION MEASUREMENTS. Ionization chamber radiation measurements for the gamma-ray and neutron curves are both recorded by continuous null balance systems which function independently. This null principle of measurement constitutes the most accurate means of measuring the minute currents developed in the ionization chambers by the gamma-radiation. The result is accurately recorded measurements of radiation intensity reproduced at the surface, independent of any variations in cable characteristics, vacuum tube performance and other changeable factors.

Figure 3 represents the circuit arrangement for the two-pen well logging apparatus. Referring to the diagram, each ionization chamber develops a minute direct current proportional to the incident gamma-radiation. Considering the gamma-ray curve only, for the sake of clarity, this current (generally less than 10^{-12} amperes) passes through a high resistance, R_1 to ground. The resultant voltage developed across this resistor constitutes a measure of radiation intensity.

Resistor R_2 presents a low resistance, in the order of 10^{10} times smaller than the value of resistor R_1. A current through resistor R_2, is supplied from a slidewire in the recorder at the surface and is carried to the resistor over the three wire well cable. The current varies directly in accordance with the position of the measuring servo in the recorder. When the current through R_2 equals 10^{10} times the ionization

current through R_1, the voltages across each resistor will be equal. This status constitutes the null point of the system which the servo arrangement embodied in the dual recorder automatically maintains.

In logging, with the system at the null point, any increase in gamma-radiation causes the voltage across R_1 to exceed that across R_2. Referring again to the circuit diagram, a vibrating condenser type electrometer, connected between these two resistors, responds to this unbalance by generating an a-c signal of a magnitude which corresponds to the voltage differential between the two resistors. This a-c signal is amplified and transmitted to the surface where it is ultimately applied to the recorder.

The servo system in the recorder reacts by moving the slidewire in the direction necessary to increase the d-c feedback until the voltage across R_2 again equals that across R_1 and a new null point is established. At the null point, no potential difference exists between the two resistors.

Consequently, the vibrating condenser electrometer develops *no* signal, and the servo system comes to rest. Since the pen is mechanically coupled to the slidewire, its position on the chart corresponds at all times to the feedback current, and hence, to the radiation intensity.

Recognition of an increase or decrease of radiation intensity from the previously measured null point is based upon polarity and phase relationships. The polarity of the unbalance voltage between resistors R_1 and R_2 depends upon whether the radiation intensity has increased or decreased from the previously attained null point. The electrometer reacts to a reversal of the polarity of the unbalance voltage with a phase reversal of its output signal. A separate phase reference signal is derived from the mechanism which drives the vibrating condenser and is transmitted to the surface equipment. Since this signal is unalterably synchronized with the vibrating capacitor, it necessarily must be either in phase or out of phase with the output of the electrometer, depending on the polarity of the unbalance voltage.

The electrometer and reference signals are compared in a synchronous rectifier located in the control panel. The result is a direct current which corresponds in relative magnitude and polarity to that detected by the electrometer but at a much higher power level. This amplified replica of the unbalance is applied to a particular measuring circuit of the dual recorder where it is reconverted to an a-c signal by the converter incorporated in the electronic amplifier embodied in the recorder.

A change of polarity of this direct current again produces a phase reversal in the recorder servo system which in turn determines the direction of rotation of the two-phase balancing motor employed to position the pen and slidewire. Thus, the recorder movement is controlled in velocity and direction so as to continually reduce any unbalance between the voltages across R_1 and R_2 to zero by increasing or decreasing the feedback current. Concurrently, the recorder pen follows these changes of current and traces a graph of gamma-ray intensity. Both electrometer-recorder systems operate simultaneously in the same manner, drawing two independent curves at once.

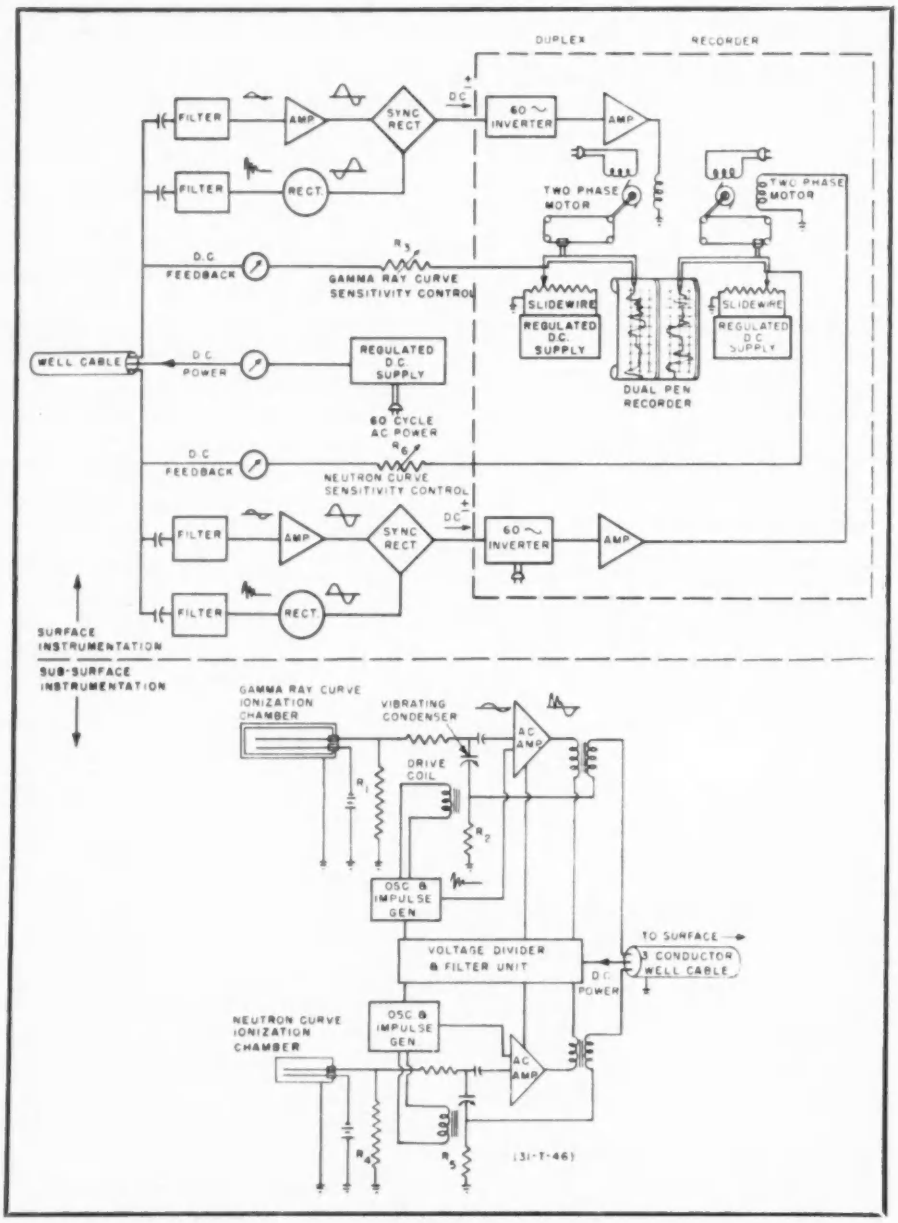
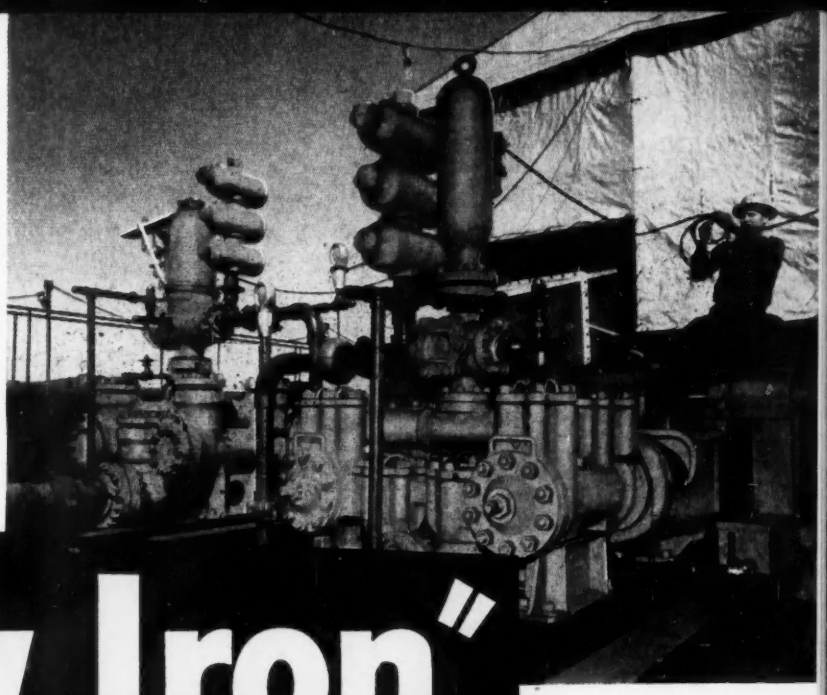


FIGURE 3.
Circuit diagram of two-pen radioactivity well logging equipment.

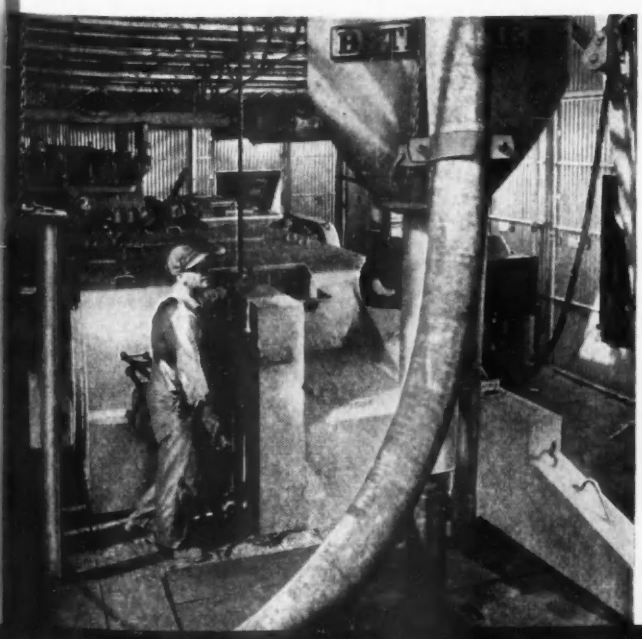
INTERFERENCE BETWEEN TWO NULL BALANCE SYSTEMS NEGLIGIBLE. Separate conductors in the well cable permit simultaneous operation of the two independent null-balance circuit chains. Interaction between the two chains is imperceptible notwithstanding a certain amount of a-c cross coupling existent in the cable. The use of null balance systems in which the measurement signals are transmitted via direct current reduces to negligible proportions the cross coupling effect, since alternating currents are employed only for error correction.

The overall sensitivity (amount of recorder pen movement for a given change of radiation intensity) is gov-

WHEREVER WELLS ARE DRILLED THERE'S



Yellow Iron"



Almost everywhere in the rotary country today you're bound to encounter Bethlehem drilling equipment—known familiarly to the trade as "yellow iron." Since drilling equipment is always "iron" to the men in the field, any Bethlehem unit, whether a drawworks, pump, swivel, rotary, or block, is "yellow iron."

Bethlehem drilling equipment has been well known in the field since the advent of rotary drilling. Today you see so many Bethlehem rigs that they're an accepted symbol of modern, high-speed drilling.

Yes, you see 'em—and you hear about 'em, too. The men who run these rigs have plenty to say, and it's stuff we like. They tell us the yellow iron has proved itself; will make hole fast and make it cheap.

Whether you're drilling in the Rockies, in Canada, on the West Coast, in the great Southwestern fields, in the Midcontinent region, or in those areas requiring barge rigs and offshore drilling operations, Bethlehem equipment will give you your biggest dollar's worth. It will help you take the fight out of the earth's toughest crust. From crown block to the bottom of the hole, you can really have faith in your Bethlehem rig . . . the rig of "yellow iron."

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erned by the adjustment of variable resistor, R_3. When set to a point of minimum resistance, a small amount of slidewire movement produces the necessary change in feedback current. Increasing the resistance of R_3 necessitates greater movement of pen and slidewire to produce the same change in feedback current.

The value of R_3 is always large in comparison with the series resistance represented by the well cable. Consequently, variations of the cable resistance with temperature or other causes produce no appreciable effect on the measuring system. Since resistor R_2 is extremely small, cable insulation leakage becomes a negligible factor. With a fixed value of R_3 and a constant voltage across the slidewire, pen positions are determined solely by the ionization current and the ratio of the two resistors, R_1 and R_2, and are essentially independent of the performance of the remaining circuit elements.

RECORDER CHART MOTION SYNCHRONIZED TO HOIST CABLE. The recorder is equipped with a synchro motor to operate the chart drive mechanism. A matching synchro motor geared to the hoisting cable sheave is electrically connected to the motor in the recorder. This combination produces a chart movement in precise relationship to the upward travel of the hoist cable. The recorder gearing is arranged so that standard log scales of one, two, or five inches of chart motion are synchronized with each hundred feet of cable movement.

As represented in the typical well log (Figure 4), the gamma-ray curve is recorded on the left of the instrument chart by one pen, while the second pen records the neutron curve on the right. The pens, however, are able to cross each other in the event of encountering excessive intensity variations while recording the log.

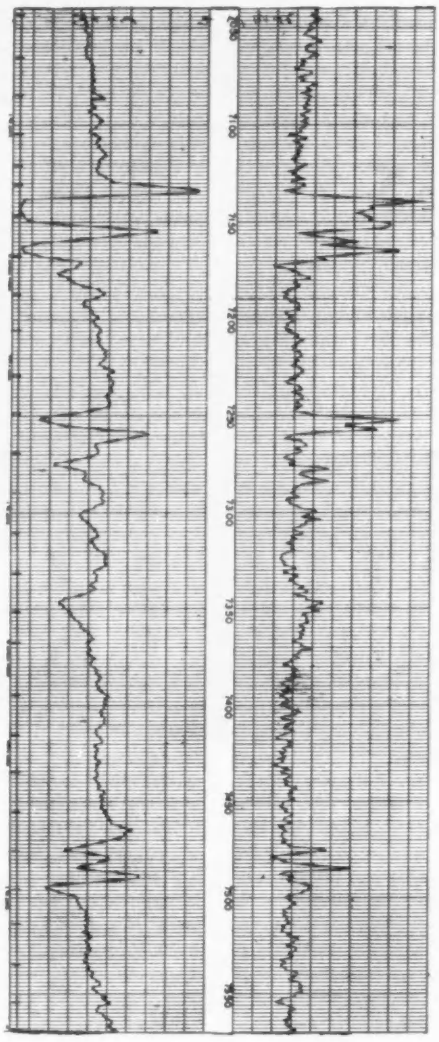

FIGURE 4.
Typical log showing neutron and gamma curves.

The neutron pen is spaced approximately lower on the chart to correspond to the vertical distance between the two detectors on the subsurface instrument. The lowest recording point for the neutron curves is within two feet of the bottom of the well and within twelve feet for the gamma-ray curve.

A solenoid actuated third pen on the recorder registers casing joint positions on the left margin of the chart. This pen reacts to signals from the casing collar detector in the subsurface instrument which are transmitted to a control panel unit located immediately below the recorder (see photos on first page). An additional unit in the control panel supplies power for operating the sub-surface equipment.

Neutron and gamma-ray curves recorded simultaneously with the equipment are equivalent to the same curves made during separate runs and are, in some respects superior from a comparison standpoint. However, the superiority of the recorded curves, side by side on a single chart, is but a small advantage in comparison to the drastic 50 percent reduction in logging time.

ACKNOWLEDGMENT

Prepared for WORLD OIL and based on a paper: "Simultaneous Gamma Ray and Neutron Logging" by Gilbert Swift, *Geophysics*, Vol. 17, No. 2, April, 1952.

. . . about the authors

C. C. Roberts

Gilbert Swift

C. C. ROBERTS studied electrical engineering and basic electronics at Carnegie Institute of Technology, Pittsburgh, Pa. He was a time instructor in electronics at University of Pittsburgh and lectured and wrote on radio and electronics prior to entering the field of industrial instrumentation with Minneapolis-Honeywell Regulator Company, Industrial Division, Philadelphia. Has been with the Industrial Division of Honeywell for six years as an application engineer and writer.

GILBERT SWIFT received his B. S. degree in electrical engineering in 1933 from the University of Pennsylvania. From 1935 to 1940 he was engaged in the development of electronic measuring instruments at R.C.A. In 1940 he resigned to join the newly formed Well Surveys, Inc. at Tulsa, participating in the development of the first commercial radioactivity well logging service. From 1942 to 1946 he served as Officer in Charge, Direction Finding and Intercept Section, Signal Corps Engineering Laboratories. He attained the rank of major and was transferred to inactive duty in January 1946 and rejoined Well Surveys, Inc. He was designated chief engineer in 1947. In 1949 he was awarded the professional degree of electrical engineer by the University of Pennsylvania. Swift is a member of Society of Exploration Geophysicists, Institute of Radio Engineers, and Geophysical Society of Tulsa.

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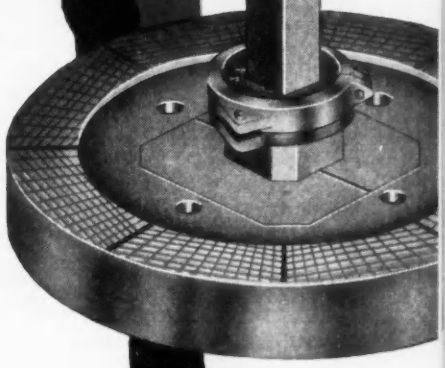

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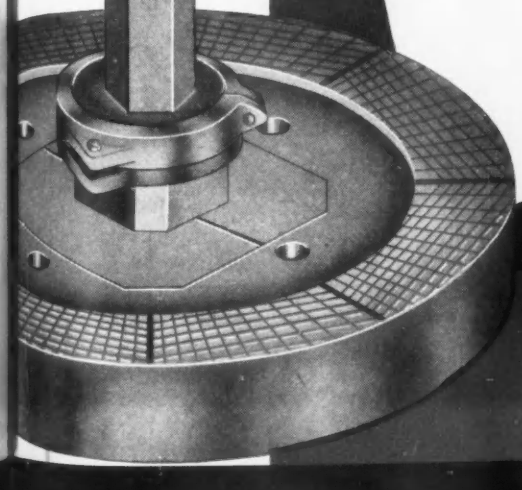

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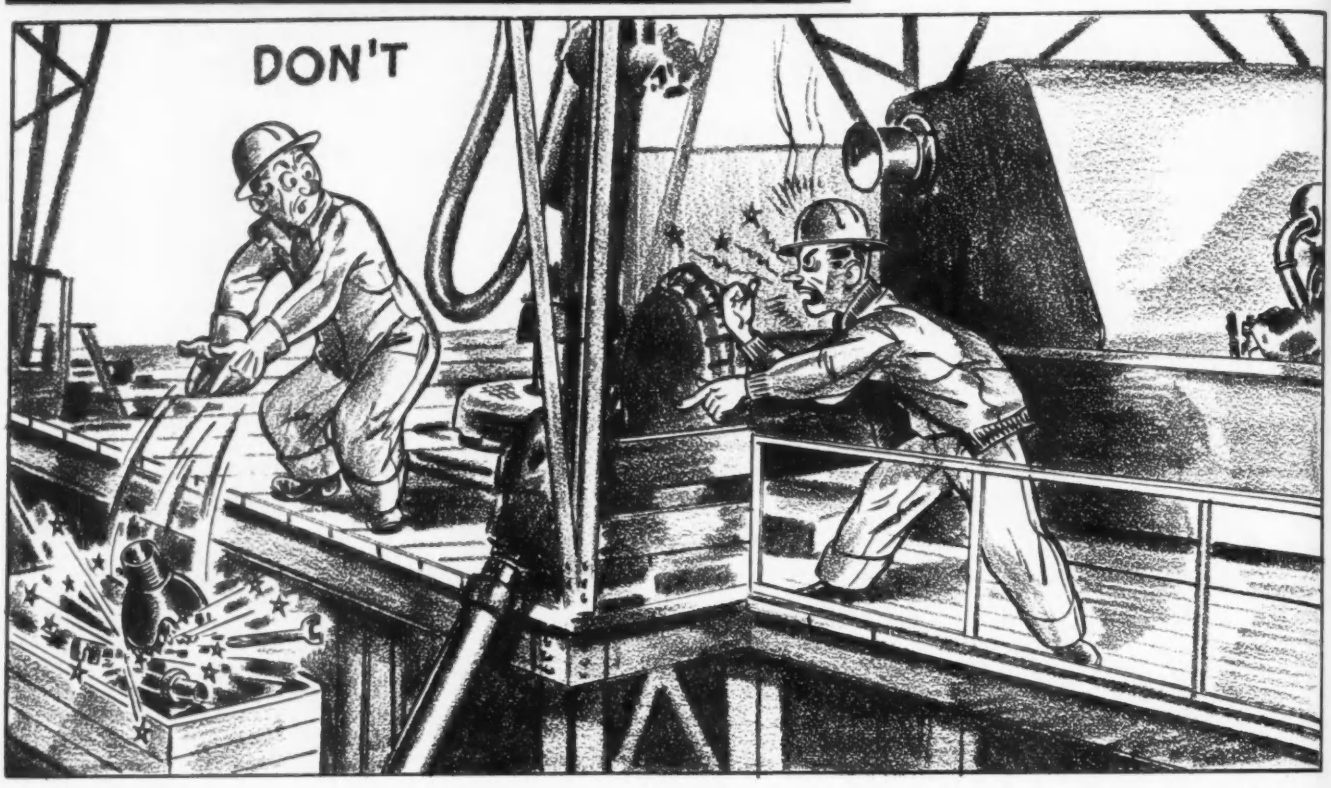


When a "green" bit is pulled it should be treated as a new one and not exposed to damage by impact or weather.

Extra footage will be gained if bit is carefully cleaned, bearings lubricated, then stored in box until needed.

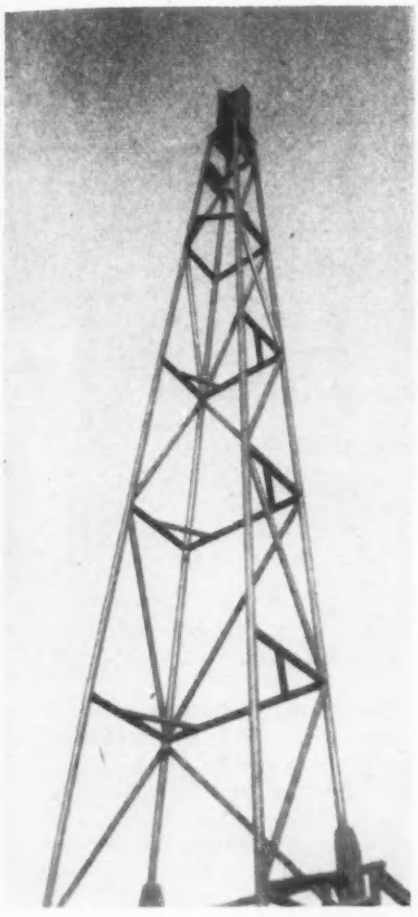


FIGURE 1.
Derrick 42 feet tall, fabricated of 2⅜-inch drill pipe, offers rigid support for crown unit.

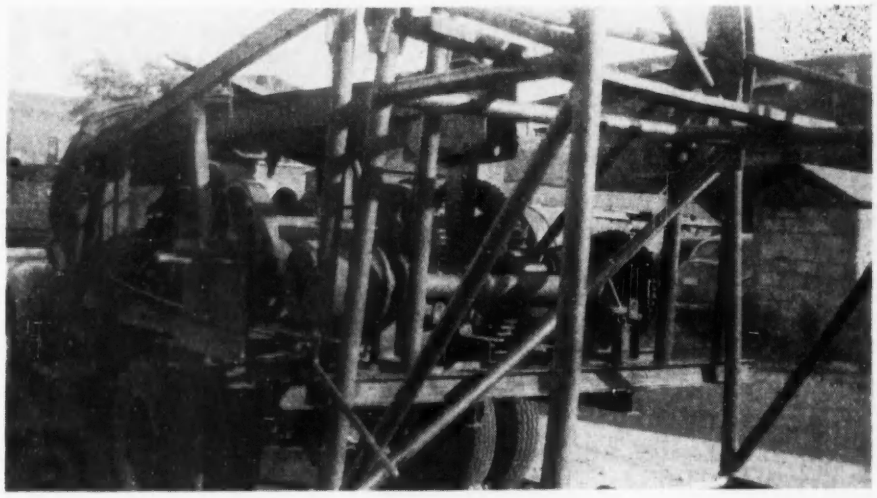


FIGURE 2.
Truck and equipment showing spudder arm, cable drums, sand line drum and jack shaft which is used to drive rotary element.

Shop-Made Rig Speeds Operations

By A. R. FRANK, Vice President
Shaw Oil & Chemical Corporation
Bowling Green, Ky.

AN INEXPENSIVE shop-made rig which will perform as a spudder or as a rotary unit has been designed for work in areas where combination rigs are a necessity. This rig offers complete unitization, permitting rapid rig-up and tear-down practice, and is fully streamlined to speed workover practice.

It is possible to take this rig and drill a cable tool hole, make a rotary set-up, drill to the pay zone with the rotary, lay the rotary equipment down, set a string of casing, make a test in an open hole and finish bringing the well in by cable tool. If it is necessary to pull a heavy string of casing the rig is equipped to complete that job. Its versatility and flexibility offer proficiency in eliminating excessive costs of completing wells.

The equipment was built at an overall cost of $13,000, including the truck and machinist labor. It was built from automobile parts and conventional rotary and cable tool equipment salvaged from a burned portable unit.

Derrick. The derrick, which is mounted on the bed of a three-ton truck, is made of 2⅜-inch drill pipe. It is raised and lowered by a pulling drum assembly. When fully extended the derrick is 42 feet high.

The drill pipe legs are well braced, (Figure 1) imparting rigidity for a new crown block unit.

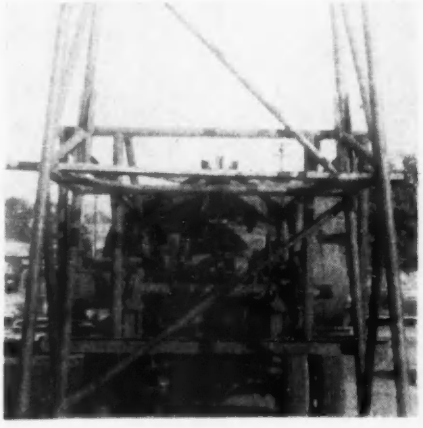


FIGURE 3.
Rear view of cable assembly with power drive mechanism in background.

Three heavy sheaves are used for pulling casing or drill stems by passing a heavy wire line through the crown sheaves and a double sheave traveling block. When the derrick is lowered and not in use it rests in a cradle mounted on the truck.

Power Drive. Power is supplied by utilizing the drive shaft of the truck on which the unit is mounted. A power takeoff is driven by the drive shaft and in turn drives a double roll chain connecting to a transmission box. This combination gives 15 forward gears and five reverse.

Cable Tool Assembly. The assembly is a shaft and spudder arm. The cable drum, from spudder, handles about 5000 feet of drilling line.

The pulling line, consisting of an assembly taken from an old clam shovel which has dual heavy-duty brakes, is mounted in the center. The gear wheel, also from an old clam shovel, is two inches larger and heavier than those on the shaft.

The sand line drum, taken from an old drag line, is equipped with dual brakes and is mounted on the drillers side. The spudder arm has been designed to eliminate as much shock as possible and is driven by an eight-inch flat belt.

Rotary Assembly. Very simple to install. A jack shaft is extended to the back of the truck and all that is necessary to make a rotary of this unit is to install a sprocket and tie it into the rotary table. Twenty-foot singles are used, although they have to be laid down because of the height of the derrick.

Closed Steam System on Drilling Rigs Cuts Boiler Maintenance, Fuel Needs

Here's how one company increased plant efficiency by nearly 20 percent and reduced water treating problems to a minimum.

By GEORGE L. DAGGS
Richardson and Bass, New Orleans

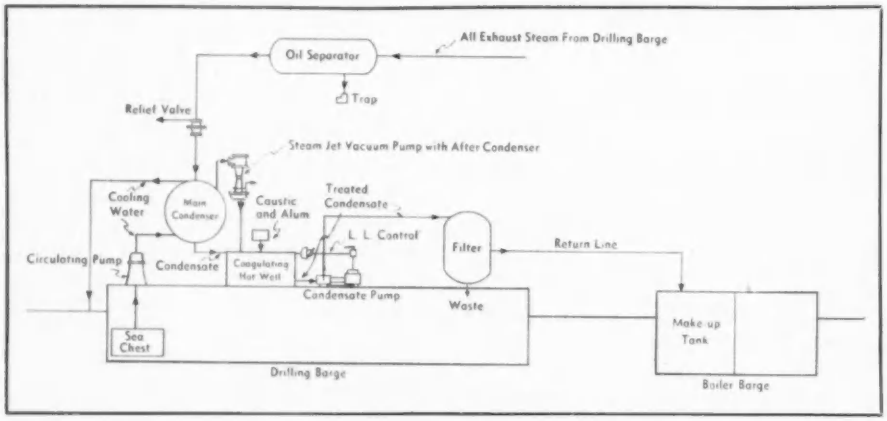


FIGURE 1.

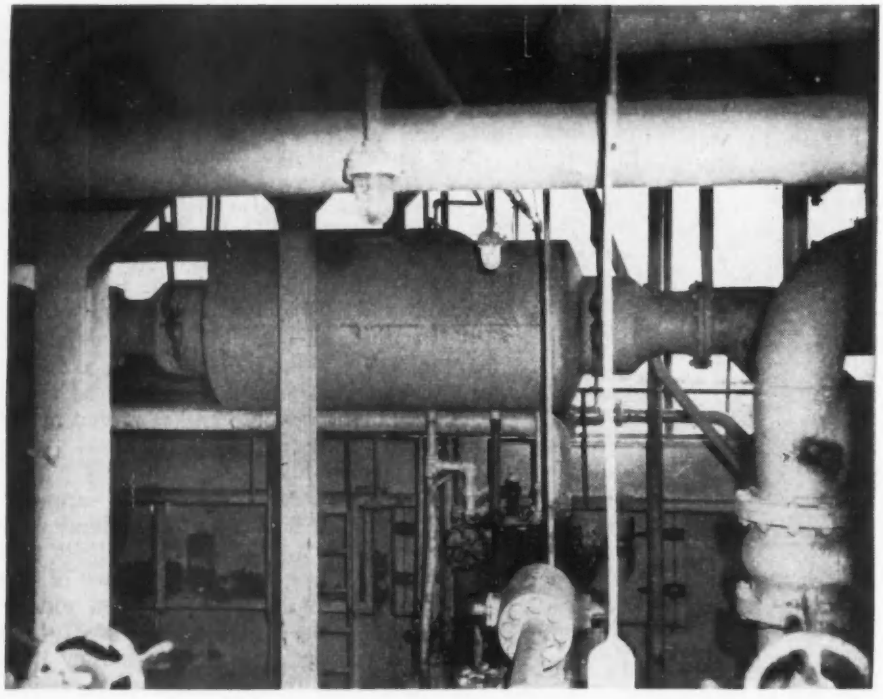


FIGURE 2.

NOW OPERATING IN the Lake Washington area of Plaquemines Parish, La., Richardson and Bass Rig 25, the drilling barge Keystone, incorporates one of the few such installations currently found in the drilling industry. All exhaust steam from the rig pumps, drilling and rotary engines, the various turbines and other equipment on the main drilling barge is condensed and returned to the make-up water tank on the boiler barge. The actual water consumption is thus reduced to what is required for drinking and washing purposes, for use in the mud, and for generating the steam which is lost through boiler blow-downs, operation of the feed pumps and turbines on the boiler barge, and leakage.

This rig is designed for drilling wells in those portions of the Gulf Coast where there is much more water than dry land. However, water suitable for boiler usage must often be bought and hauled by barge for sizable distances to the location. When the various factors are considered, such as cost of the water supply, the expense of operating tugs and barges, the difficulty in hauling due to low tide or bad weather, involving the danger of a possible shutdown, and the additional treating expense necessary on a large amount of raw make-up water, the advantages of such a system become evident.

Operation is as follows: (see Figure 1) All exhaust steam from the drilling barge enters the centrifugal-type oil separator, (Figure 2) where the free oil is removed and discharged by means of a steam trap (Figure 3) to a sump in the rear of the barge. The steam then goes to one of the two

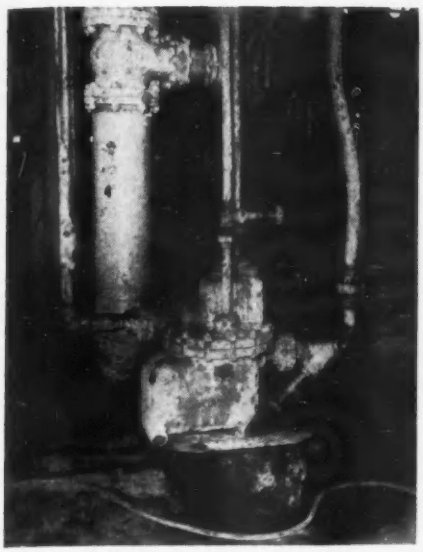
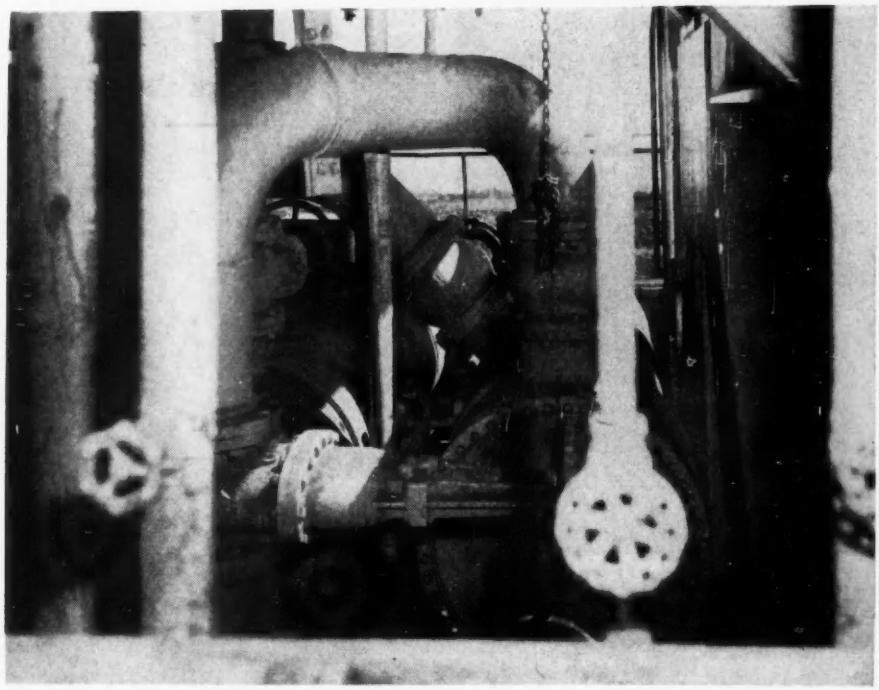


FIGURE 3.



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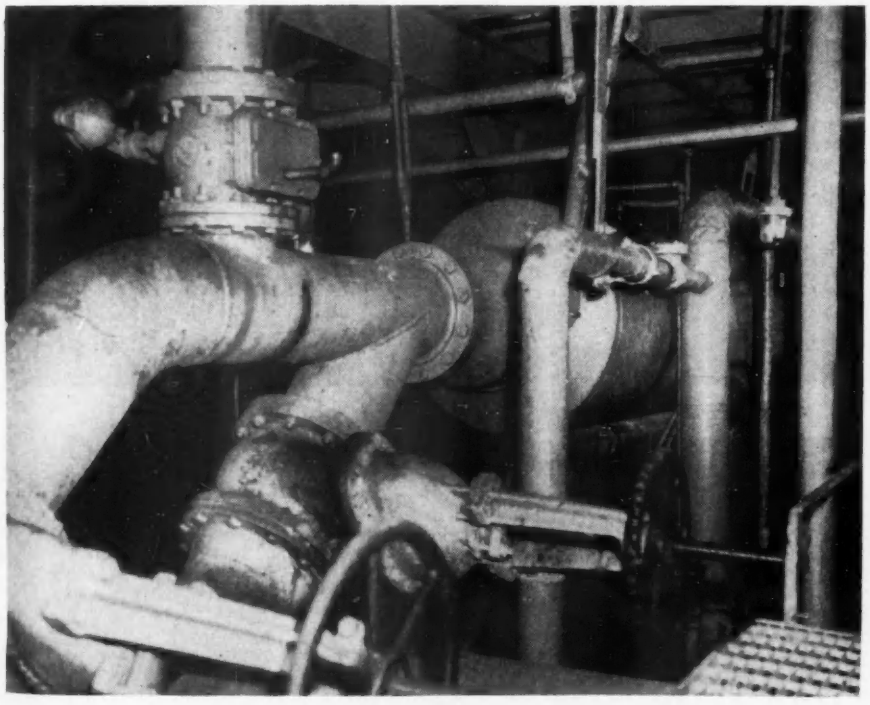

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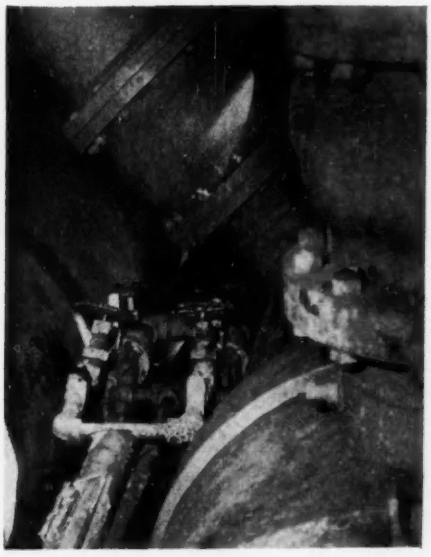


FIGURE 6.

condensers (Figure 4). A back-pressure valve (Figure 5) is located in the line between separator and condenser to allow the steam to be bypassed to the atmosphere in case the pressure should build up too much on the condenser.

A vacuum of 12 to 15 inches is maintained on the condenser and condensate tank (hot well) by means of a steam jet vacuum pump (Figure 6). Exhaust from the vacuum pump goes through a small after condenser, the condensate going into the main hot well, and the air being vented.

Cooling water is circulated through the main condenser at a rate of 2100 gallons per minute by a centrifugal pump (Figure 7) which is driven by a turbine (Figure 8). The discharge from the condenser is shown in Figure 9. On this rig each condenser has a pump and turbine.

The condensate, after it leaves the condenser and enters the hot well, is chemically treated with alum and caustic soda or soda ash to floc the remaining oil and solids present. The liquid level in the tank is controlled by a valve (Figure 10) which regulates the steam supply to a 10 x 5 x 10 condensate pump (Figure 11).

The treated condensate is then pumped through one of a pair of filters, (Figure 12, background) where the oil floc is removed, and the clean water returns to the make-up tank on the boiler barge to be used again.

More Pictures on Page 134

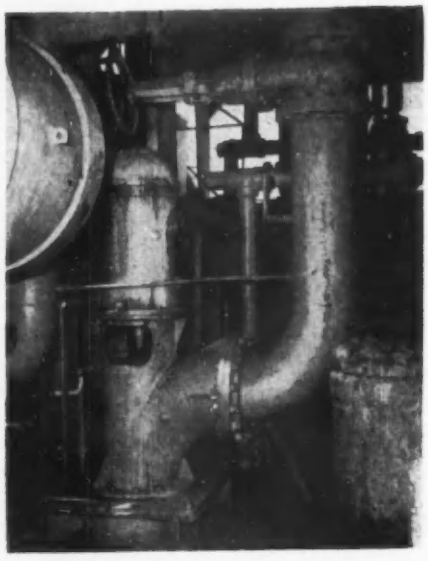
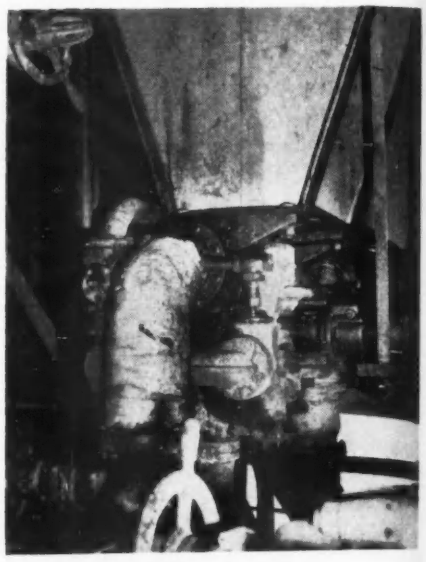


FIGURE 7. ←

FIGURE 8. →



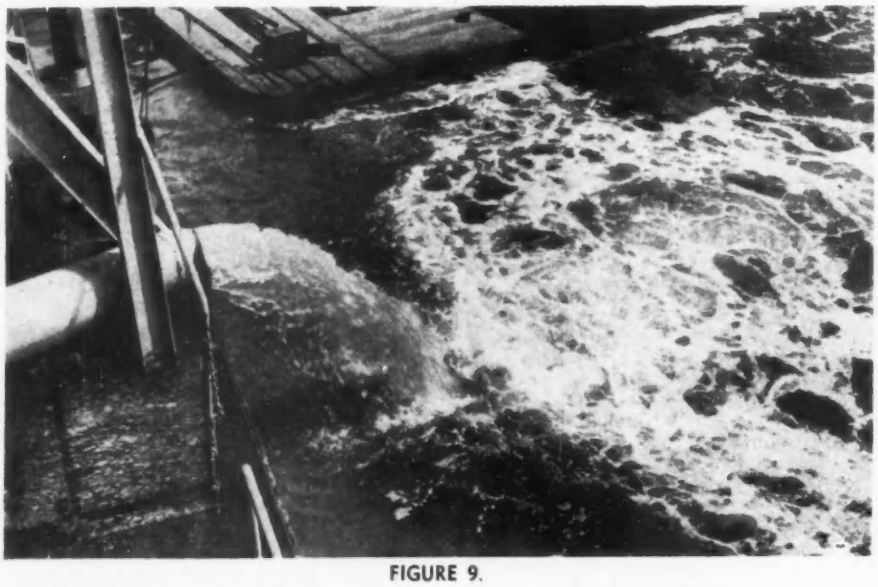


FIGURE 9.

FIGURE 10.

FIGURE 11.

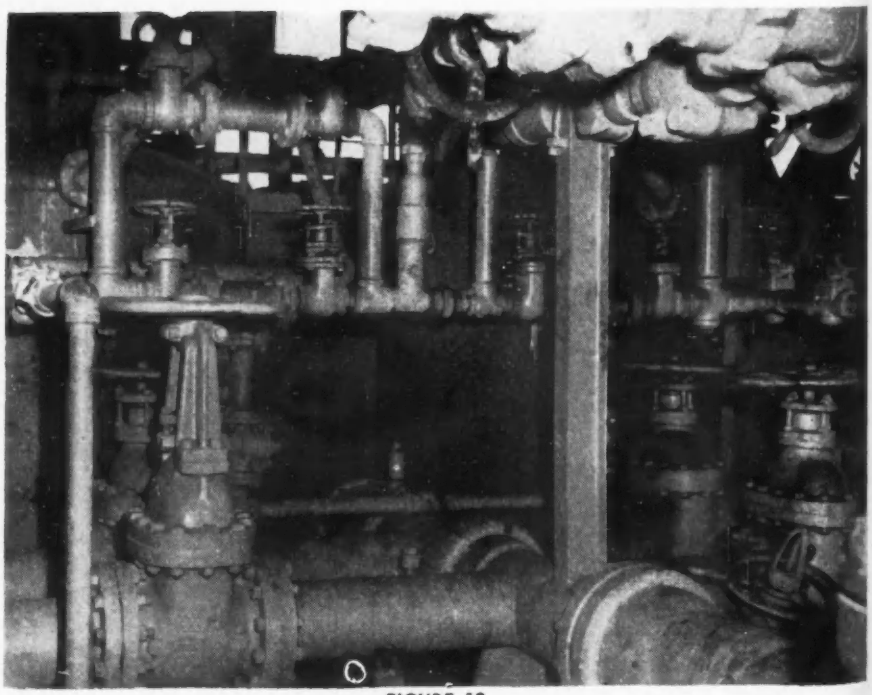


FIGURE 12.

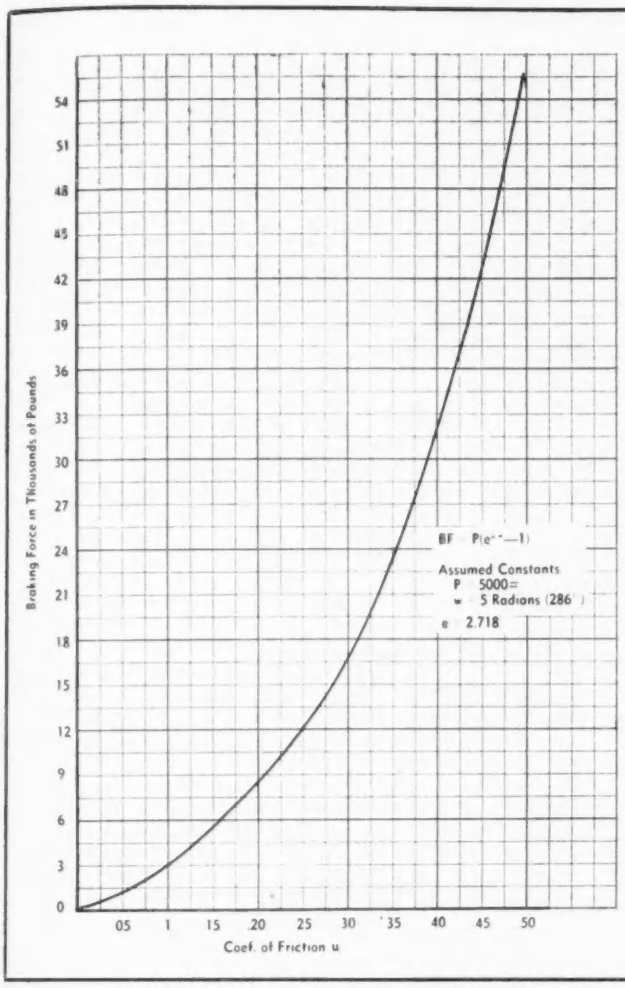


FIGURE 1. Braking force vs. coefficient of friction between blocks and rim.

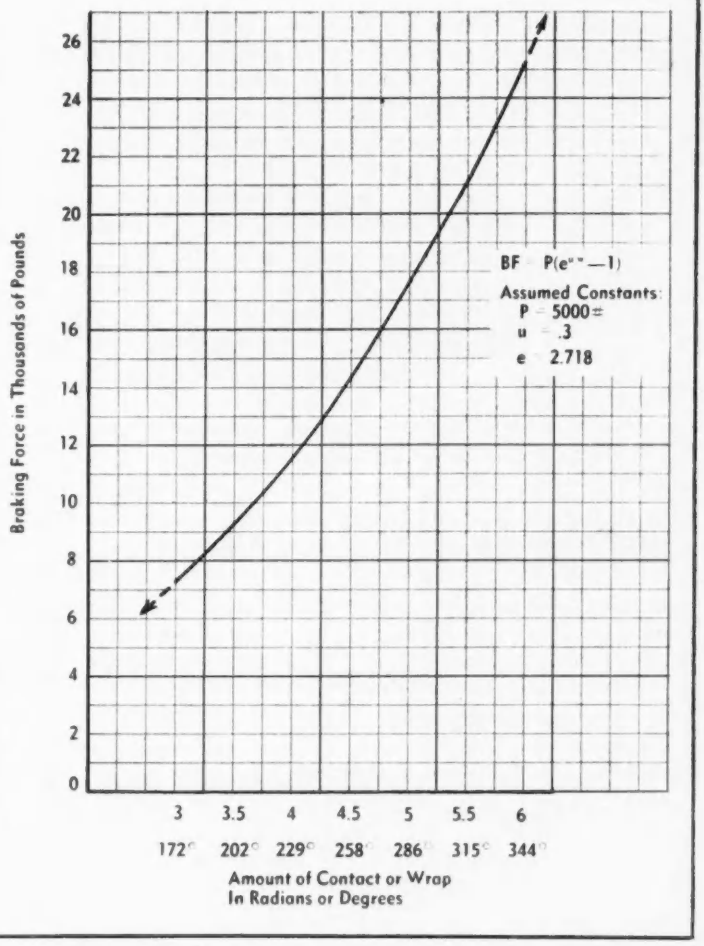


FIGURE 2. Braking force vs. amount of contact expressed in radians.

How to Select and Install Braking Equipment for Your Drawworks

Here's an explanation of procedure for a revamping job and hints on the selection of a new system.

By ALLAN FREDHOLD
Emsco Derrick and Equipment Company, Los Angeles

THE PRINCIPLE OF the wrap type energizing brake, which is at present used on practically all main drawworks drum brakes, is often neglected by the operator both in adjustment and operation on location, and in a comparison of brakes at the time of purchase.

Energizing Principles. The idea that the rim width and the resulting amount of contact area or rim diameter, within reasonable limits, has any major part to play in actual braking force has somehow become wrongly fixed in a great number of minds. The maximum braking force is fundamentally concerned with two variables: (1) amount of wrap or degrees of contact (2) coefficient of friction between the brake blocks and the brake rim. For a wrap brake with one end dead-ended the formula is:

$$BF = P(e^{uw} - 1)$$

where:

BF = braking force (on rims)
P = force or pull on live end
e = base of natural logs (2.718) constant
u = Coefficient of friction between blocks and rim
w = amount of contact expressed in radians (radians $= \frac{180°}{\pi} = 57.29°$)

The force P is naturally dependent upon the linkage between the brake handle and the clevis on the end of the band at the point of tangency. Some different results obtained with various type linkages are discussed elsewhere in this article.

As seen from the foregoing formula, small variations in exponental functions u or w can vary the braking force termendously.

In any one design w will be, to all practical extent, constant (K) so that the braking force with a constant applied force (P) will vary as e^{uK}. Very small variations in u, as can happen

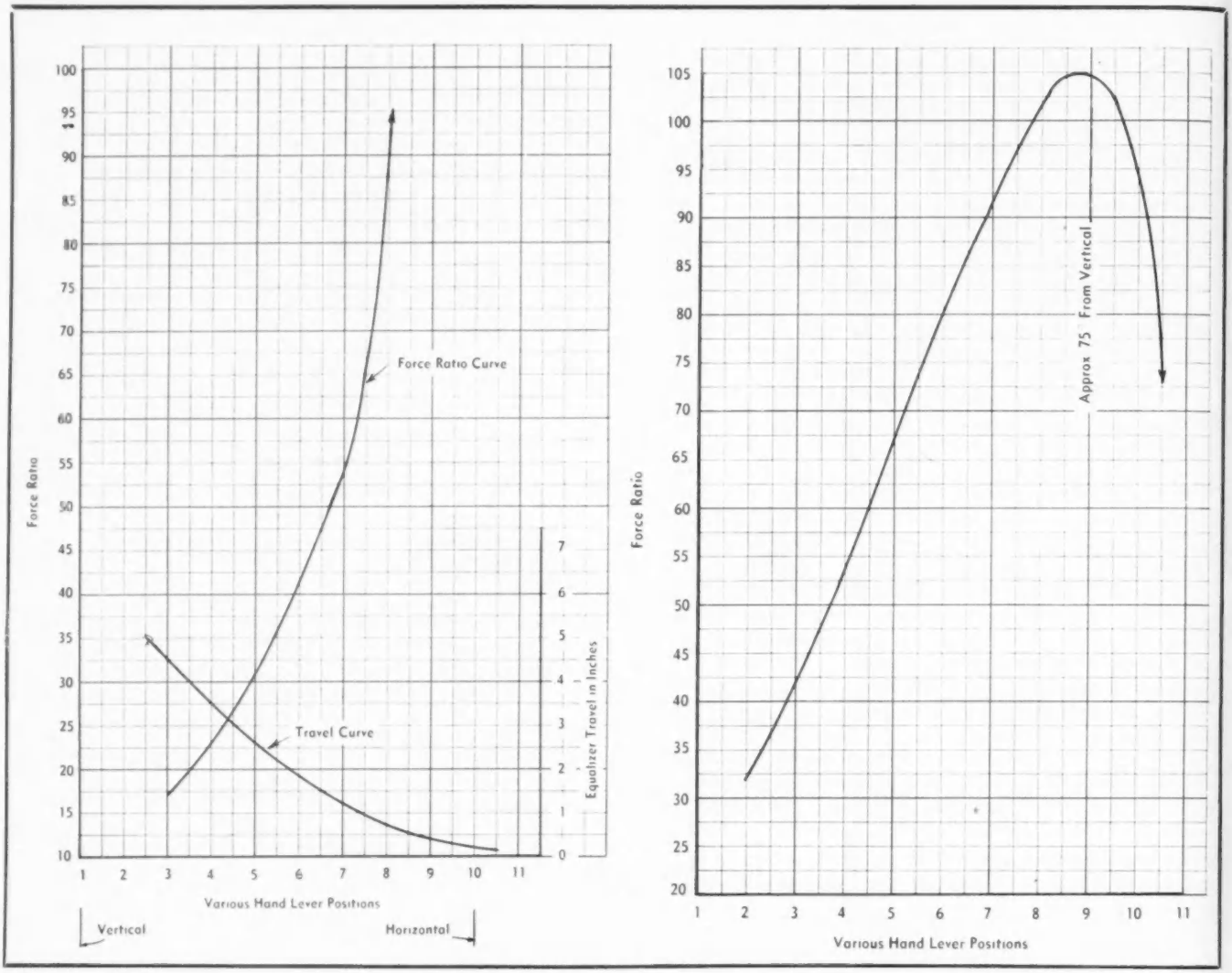


FIGURE 3. Ratio and travel vs. position.

FIGURE 4. Ratio vs. position.

with slightly wet or oily surfaces, cause a multiple effect on braking force. Heat can also make u vary considerably and it is therefore important that the bands be kept as cool as possible by water circulation when stopping heavy loads. It is sometimes necessary for the brakes to stop and dissipate thousands of horsepower and it is here that the cooling system, contact area and design material play important parts. Figures 1 and 2 show the variation in BF experienced by small variations in functions u and w.

From the foregoing it is seen that one band will have the same braking force as two bands. Should one band on the drawworks fail, and the safety linkage is such that the handle still is able to transmit the force into the other band (as is usual) this one band will have the same load stopping capacity as the two bands together except where excess heat lowers the frictional exponent. Of course the wear on the blocks will more than double due to the same energy being dissipated over a smaller area with increased heat. With the advent of auxiliary water or electric brakes, however, the trouble experienced with excessive heating has been largely minimized.

The braking force previously mentioned is not actually the force that stops the load as the difference in diameter of the rim and the drum multiplies the braking effect on the line by the ratio of the two diameters. The greater the difference in diameters, the greater line load the same amount of breaking force will hold. The diameter of the brake rim means little unless it is considered in relationship to the drum spool diameter.

A comparison of the maximum load holding ability of two frictional brakes is calculated as shown in Table 1, il-

TABLE 1

SPECIFICATIONS	Brake A	Brake B
Drum spool diameter	28 inches	28 inches
Brake rim size, diameter and width	50 x 11	48 x 9
Degrees of contact (wrap)	270 degrees	330 degrees
Mechanical advantage of linkage	52	50

*Rim diameter to spool diameter ratio = D_R
Mechanical advantage of linkage = MA
Load holding Capacity = L $\quad L = BF \times D_R$
Tangential force = P = 150 x MA

* The difference in diameter due to line is neglected.

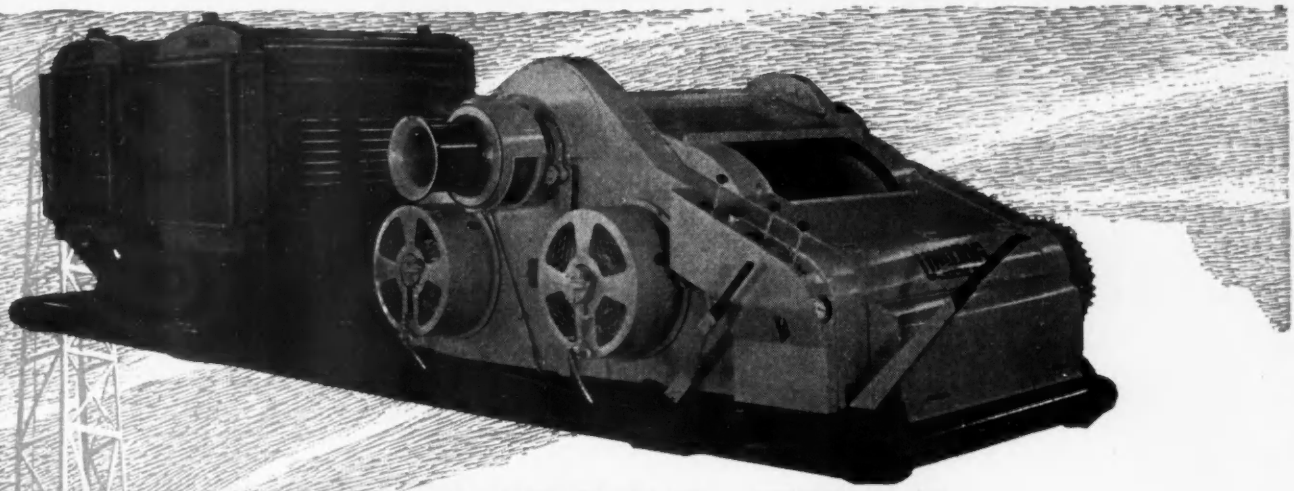
$BF = P(e^{uw}-1)$
$L = 150lb \times MA\ (e^{uw}-1)D_R$

$L_A = 150 \times 50(2.718^{1.42}-1)D_{R_A}$

$L_B = 150 \times 50(2.718^{1.73}-1)D_{R_B}$
$L_A = 150 \times 52 \times 3.137 \times 1.79$

$L_B = 150 \times 50 \times 4.64 \times 1.71$

$L_A = 43{,}800$ lbs. $\quad L_B = 59{,}500$ lbs.



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*One set of clutches shows slight wear after 90,000' of drilling. To March, 1951 only one clutch failure —caused by low air pressure.

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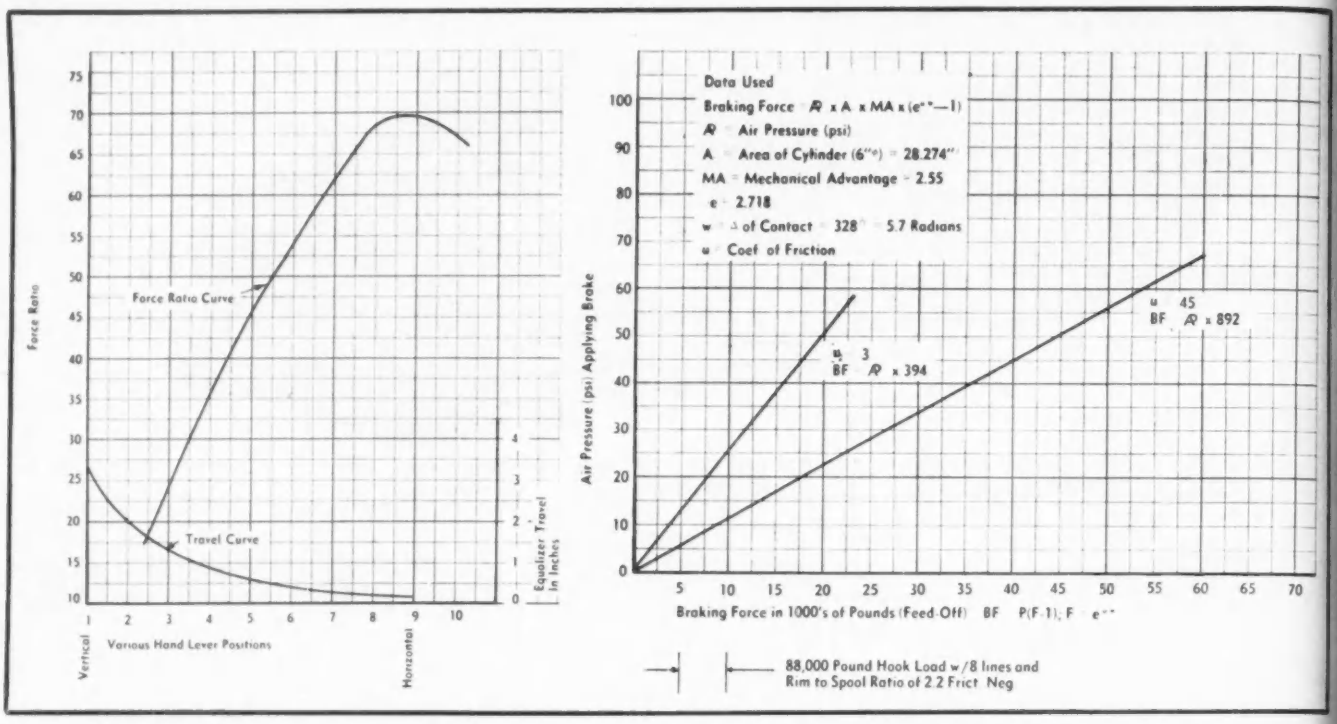

FIGURE 5. Ratio and travel vs. position.

Data Used
Braking Force = P x A x MA x (e^uw − 1)
P = Air Pressure (psi)
A = Area of Cylinder (6"ø) = 28.274"
MA = Mechanical Advantage = 2.55
e = 2.718
w = ∠ of Contact = 328° = 5.7 Radians
u = Coef of Friction
u = .45
BF = P x 892
u = .3
BF = P x 394
Air Pressure (psi) Applying Brake
Braking Force in 1000's of Pounds (Feed-Off) BF = P(F-1), F = e^uw
88,000 Pound Hook Load w/8 lines and Rim to Spool Ratio of 2.2 Frict. Neg

FIGURE 6. Air brake BF vs. air pressure in psi.

lustrating the error that might be made by a casual inspection without understanding the principles involved. A 150-pound weight is assumed constant on the brake handle and coefficient of friction u is asumed constant at .3.

Brake A is larger in all respects except for the angle of contact; and this one difference so outweighs all other differences that brake B is appreciably more powerful; actually has over 35 percent greater holding power.

Linkage Effect. There are many different linkages in use today on drawworks drum brakes. All of these linkages are arranged to provide certain mechanical advantages, and amounts of band travel at different positions of the hand lever. It is important that the operator realize that in many designs the mechanical advantage and resulting multiplication of braking force does not increase proportionally with handle travel. In fact, in some designs the ratio drops off suddenly at a predetermined point. If the brake is allowed to get unduly sloppy due to wear or improper adjustment and this point is reached it may be impossible to stop the required load in the necessary time.

Figures 3, 4 and 5 represent various linkage designs and the effect of such design on the mechanical advantage at different angles of brake hand lever travel. Figure 3 represents a design in which travel is sacrificed for great mechanical advantage. The small amount of travel makes it difficult to adjust this brake for proper clearance. It is also questionable if, in the event of the failure of the main-equalizer-link, enough travel would be available to allow the safety-link to take up both the necessary clearance and the angular displacement to stop the load.

About the Author

ALLAN FREDHOLD, field engineer for the Emsco Derrick & Equipment Company, was graduated from Stanford University with a BS degree in engineering. During World War II, served as a Navy aviator. Prior to his association with Emsco, Fredhold was employed by the Link Belt Company as a design engineer. He is licensed by the state of California as a professional mechanical engineer.

Figure 4 shows the drooping curve characteristic of a large number of brakes. It is seen that the mechanical advantage will be suddenly lost if the brake is so adjusted as to let the handle travel too far.

Figure 5 shows a compromise design that perhaps provides the best practical solution to the linkage problem on these brakes. In this design the mechanical advantage increases rapidly for normal operations, and the dropping off of the curve in the last part of the hand lever travel is minimized to a great extent. Equalizer travel on the other hand has been increased substantially with a maximum of over three inches as compared to .7 inches on the linkage represented by Figure 3. This increased travel makes adjustment easier and provides an increased safety travel factor should the main link fail and the safetly link be required to provide the actuating force.

Air Brakes. The use of air as the controlling force on drawworks brakes has been the subject of considerable investigation by oil well drilling equipment manufacturers for some time. From all indications, no one system has been successful enough from a cost, operation and maintenance standpoint to be acceptable to any substantial number of operators, although many designs have met with a

• CONTINUED ON PAGE 142

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Wire-drawing is a fundamental step in the making of Bethlehem rope, and it's done on machines that almost never make mistakes. Nevertheless, this operator, like others in the Bethlehem mill, runs frequent checks on the work going through. He wants to be sure that his part of the job meets the specified standards—which are very, very high.

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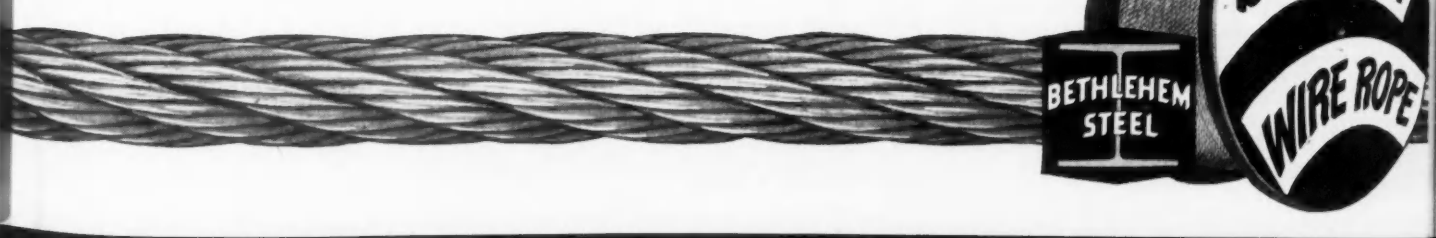

Be Safe Though Small

Safety programs are made easier when management is closer to employes.

By GORDON OLIVER
Safety Consultant, Odessa, Texas

No COMPANY IS too small to have a safety program. The contractor with only one rig employs as many men on that particular unit as he would if he owned 50 other rigs. Each crew must stand on its own, regardless of the size of the organization.

A safety program can be more easily and successfully conducted by a small contractor than by a large one. Reason is, management is much closer to its employes. It makes frequent visits to its field of operations and observes personally the equipment and the men operating that equipment. Management becomes better acquainted with field supervision and has more time and a better opportunity to take the initiative in a safety program.

But while smallness paves the road to a workable safety program, it offers no short cut. Moreover, small company programs cannot be of a pattern. No two drilling companies are alike. Practices that work for one firm will not always work for another, regardless of similarity in size. Each program must be designed according to the company's policies, and the policies will vary with the organization setups. There will be differences in the sources of safety problems, such as poor equipment, poor supervision in the field, bad management and bad communication. Causes of accidents must be determined within each company and those causes will dictate the pattern of the safety program.

If a safety man is brought in to design a program, his first step should be to meet the top man in the organization, which in the case of the one-to-five-rig contractor, is usually the owner. It may be necessary to talk with him two or three times before other personnel in the company is allowed to join the discussions. The top man's idea on his safety problems must be determined and his remedial suggestions must be developed. It is important to learn his policies toward his employes as regards employment procedure, pay periods, vacations and benefits.

It is necessary to know how much authority he has delegated to his supervisors in carrying out their responsibilities. A safety program cannot be set up without full knowledge of management's ideas on care and maintenance of equipment. It is helpful to know the owner's plans for his own future. Is he in business to make money and get out, or is it his intention to have his company operate after he retires?

Program Shapes Up

These meetings with top management should yield the outlines of a safety program which begins to take on substance in later sessions with the rig superintendents. Each supervisor must be given the opportunity of presenting his views for group discussion and to take part in a review of the accidents which have happened for several months. Part of the fault may lie within this group of supervisors, in which case corrections can be made by utilizing the collective knowledge and experience of those present.

Complete cooperation of the supervisors is vital to the new program. The attitude of the men on the rigs has a great bearing on the success of the program, and their attitude is definitely affected by the attitude of the supervisors.

Continuing the procedure of setting up a safety program from the top of the organization down, the safety man next begins conferences with men on the rigs. Now begins the real task—selling safety to those who can make or break the program. The job cannot be done with a quick pep talk and a fast exit. Criticism won't do it. Safety is a result of many things. Mental attitude, morale, supervision, health, equipment, training—all of these and more go into a safety program. Selling safety is sometimes a difficult process and the salesman must use every means at his disposal.

Field Meetings

First is the matter of where to meet. Long experience in various industries has proved that on-the-job meetings are most effective. And more recent experience in the oil industry has shown that these sessions can be held on rigs as effectively as in factories. It is seldom that any crew cannot take 30 or 40 minutes during a tour to meet in the doghouse. This has the twofold result of permitting the foreman to watch his rig during the meeting and of maintaining an informal atmosphere that would be impossible if the men were brought together in strange, formal surroundings.

Important to a good beginning is the presence of a supervisor at a first rig meeting. His introduction will show the men that management is behind the program and will help relieve the indifference or antagonism that must be expected at times. During these days of fast labor turnovers, some of the crewmen may not even know the correct name of the company employing them. They may not even know the full name of the driller who met them on the street and offered a job. They have no feeling of belonging, of responsibility. They have no yardstick for measuring their value, or importance, to company or fellow crewmen.

The wise safety engineer will aim at correcting this situation by starting a "bull session" that will encourage the crewmen to talk on any subject that interests them, however far removed from safety. Very soon, someone will introduce a safety problem either pertaining to equipment or operational procedure, and at that moment the safety program begins to work.

To insure continuity of cooperation in these conferences, it is important that the information received

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be carried up through the lines of supervision to top management. Though all suggestions cannot be put into effect, the men will be gratified that their ideas received consideration. When a suggestion for improvement is submitted, management should give proper credit to the person responsible. This will encourage more and better suggestions.

Because it may take several weeks, or even months, for the men to fully accept a program, management cannot expect immediate results. But the results, tangible and intangible, will surely come. The tangible result to the contractor is the reduction of his compensation insurance premium and medical costs. Some of the intangible results are: 1) reduction of labor turnover; 2) better housekeeping; 3) better maintenance of equipment with less major overhaul; 4) better public relations and a better reputation among operators and fellow contractors.

Safety progress can be measured by posting each month on the bulletin board an itemized account of accidents. This should include the date of accident, rig number, name of man injured, nature of accident, whether it is lost time or nonlost time, driller's name and superintendent's name.

This practice will also be helpful in overcoming the misunderstanding among some contractors and crewmen of what constitutes an accident. Many a superintendent measures a period of no accidents from the time someone was hurt. He will recall near accidents, such as when a plank fell out of the derrick or the snub lines on the tongs broke. But these incidents, according to him, are not classified as accidents because no one was hurt.

An accident, according to the dictionary, is an event which is unexpected, or the cause of which is unforeseen. It may, or may not, result in personal injury. Any accident, whether or not it causes an injury, should be investigated and steps taken to prevent its reoccurence. The crew foreman should be encouraged to delegate someone to make an inspection of the rig at the beginning of each tour. This does not mean to glance over the rig from the middle of the floor, but to inspect the equipment and determine its working order. Check sheets for inspecting equipment can be used as a guide.

Chief among the hazards to be sought out is fire. In the Spraberry area of West Texas, where most wells are drilled in with oil, fire precautions are frequently neglected. Some rigs are not even equipped with fire extinguishers. In other cases the extinguishers have not been checked for months. And some rigs have crewmen who do not know how to operate an extinguisher.

That many contractors are awakening to this particular danger is attested by the case of one drilling superintendent who is planning fire drills on each of his rigs. These drills will include instruction in how to use extinguishers, how to check and refill them, and how to put out different types of fires.

Safety is not limited to a chosen few. Every contractor can have a safety program, regardless of how many rigs he operates. Success of the program depends on the sincerity and leadership of top management, which should take the lead in planning a program, selling it to employes, and making sure that it endures. Periodic appraisals of results should be scheduled and necessary changes made promptly. Safety is a result of hard work and planning by every man in the organization.

About the Author

GORDON OLIVER began his association with the oil business in 1937 as a clerk for Reed Roller Bit Company in Odessa, Texas. He was plant manager and assistant to the division superintendent during the war years and later served with the Field Sales department before going to Empire Machinery Company at Odessa in 1948. He left Empire Machinery to join the Extension Division of the University of Texas as a training specialist. He was stationed at Odessa with the primary task of conducting the Employer Unit Plan of Supervisory Training, sponsored by the American Association of Oil Well Drilling Contractors. He remained with the University until April, 1951, when he resigned and opened a personnel and safety service. Much of his time is used by contractors too small to employ a full-time safety expert.

Braking Equipment

• CONTINUED FROM PAGE 138

varying degree of success in a particular case or locality.

Perhaps the biggest disappointment has been the general unadaptability of past mechanical brakes to air control. There is a major degree of incompatibility between the system required for a good mechanical actuated wrap type brake and the best functioning of an air controlled brake. Where the operator wants his old brake converted to air at a minimum cost or where a mechanical safety is required to work in conjunction with a primary air brake the difficulty encountered with the energizing principle becomes acute.

To provide the necessary force on a mechanical brake a large amount of both mechanical advantage and energizing is necessary. The brake is positively controlled by positioning of the lever by the driller. Air being an expansive medium does not allow any definite positioning of the cylinders, air also has a lag in its action from on to off to on again without any real feel. For this reason air brakes, when used with wrap type bands, work better with less degrees of wrap and with a lower coefficient of friction. The mechanical advantage of the linkage can usually be omitted in favor of providing the necessary force on the clevises by using the right size cylinder (s) with the required available pressure. With air used on bands designed for mechanical control a very small change in air pressure can vary the braking force extensively. Figure 6 shows the result of applying air to a mechanical brake. An air pressure variation of only a few pounds makes several thousand of pounds difference to the load. On feeding off this is a particular disadvantage. With inertia and friction to overcome it is also difficult to provide a smooth stop when making a trip as the control valve will be opened too wide before any action is apparent and then the action is apt to come all at once with a sudden stop.

There are two different air controlled brakes that have worked satisfactorily, one for some time in California fields, both being installed on large, deep hole rigs. These brakes, however, have a smaller amount of wrap and lower coefficient of friction lining than would probably be used for mechanical brakes of the same capacity. Where it is necessary to provide both air and mechanical control in the same basic system it would probably be wise to do away with the energizing type brake for best results, using something similar to the brake used on mine hoists.

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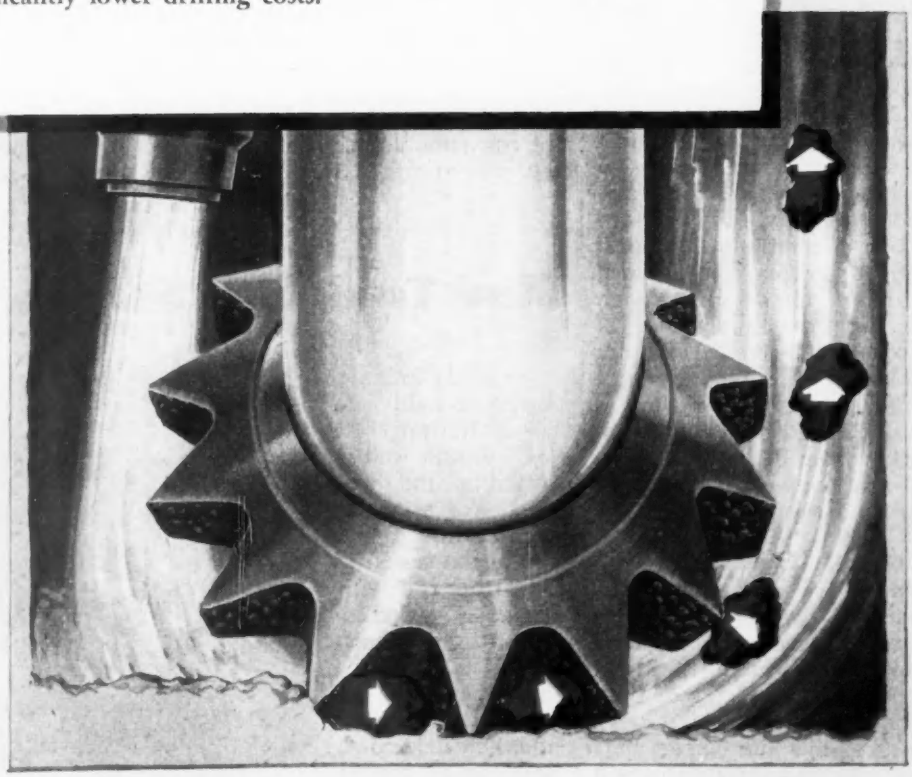

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Agitator Blends Mud Mixtures

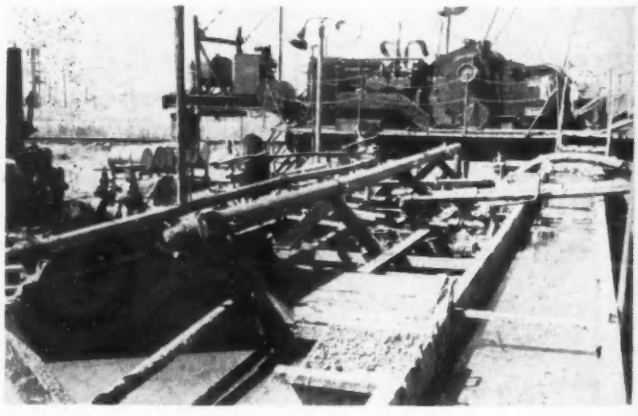
Blending of weight, dry or bentonitic material with active drilling mud can be expedited by use of an agitator which has already proved its operation. Here is the set up. The vat, or tank, is a vessel approximately six feet square and about four feet deep and is set into an excavation near the rig for convenient piping and recirculation function. The mixing pump suction is manifolded so that the fluid in this vat may be pumped back to circulate to the vat through a pipe passing through one side of the vat, usually placed nearest the pump and the rig. The discharge pipe passes entirely across the vat and is anchored at the end into a common tank flange carrying a plug at the outside. Midway between the entrance of the pipe and the anchor is a tee. Connected to the tee, and running horizontally from its position, is a vertical pipe in two sections. The connection between these two pieces of pipe is a packed swivel, and the closed bottom end rests on a support bearing. Near the bottom of the pipe sections are four "pin-wheel" shaped discharge nozzles, bent so that the bottom part of the pipe carrying the nozzles will spin as the drilling fluid is discharged by the mixing pump. With the agitators rotating as the mud flows into the tank, no dead spots exist in the vat where the fluid is being prepared.

Tanks on Skids Moved Easily

Fresh water tanks at a rig in New Mexico are equipped on one side with twin skids which are welded to similar material attached to the bottom of the tanks. With the skids in place the water tanks can be loaded and unloaded easily. Both the skids and foundation sections are "I" beam steel welded to the tank. Bearing plates are inserted between the thin walls of the tanks and the heavy structural steel at the beginning of the welding operation.

The upper ends of the skids are of the conventional sled runner type, and are joined with a tow-bar. To load the tank on the transport truck the winch line is attached to the bar and the tank is skidded upon the flat bed in horizontal position. In unloading, the operation is reversed. As the tank meets the ground it is tipped to a vertical position.

Mud Tank Has Service Line



So as to eliminate setting a mud distribution manifold each time a well is rigged up, the service line is attached permanently to the top of the vessel. It is supported with A frames welded to the cross members. Saddles are provided into which the service line is laid and there held down with clamps shaped as 'U' bolts. Cross walks are placed on the mud tank for men to operate the mud jets, shale guns and agitation nozzles. Hooking up this service line requires only the connection of the discharge piping to the line with an easily operated flange, or lip union.

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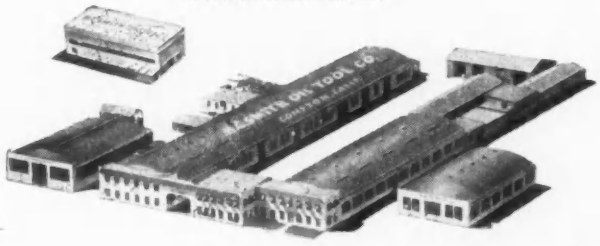

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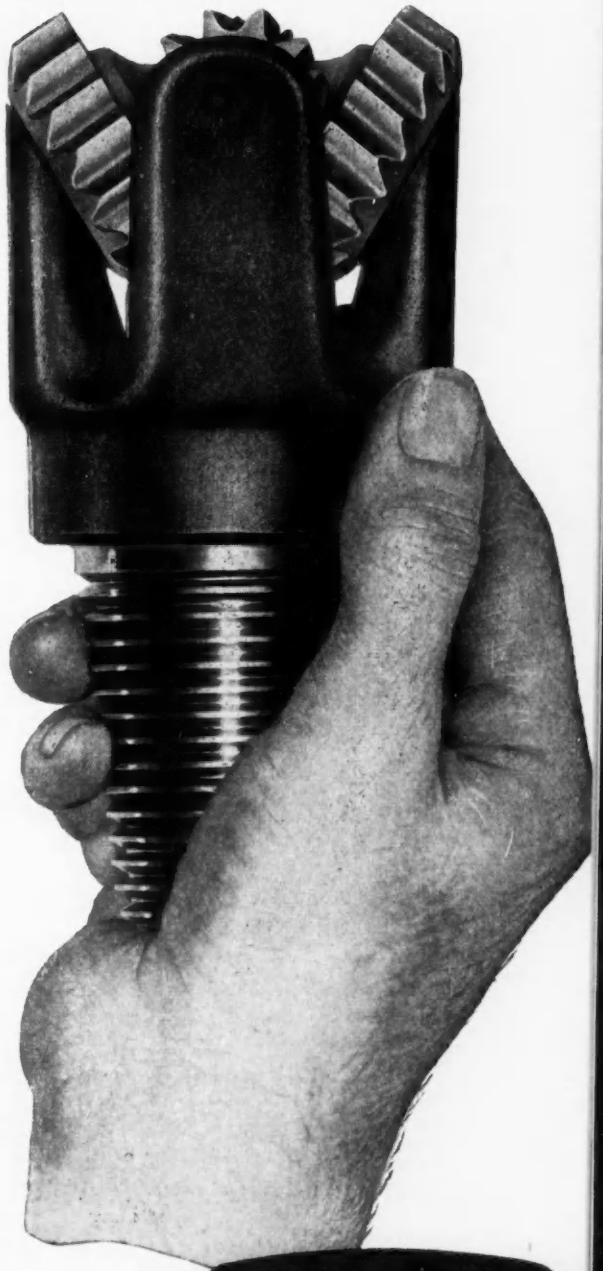

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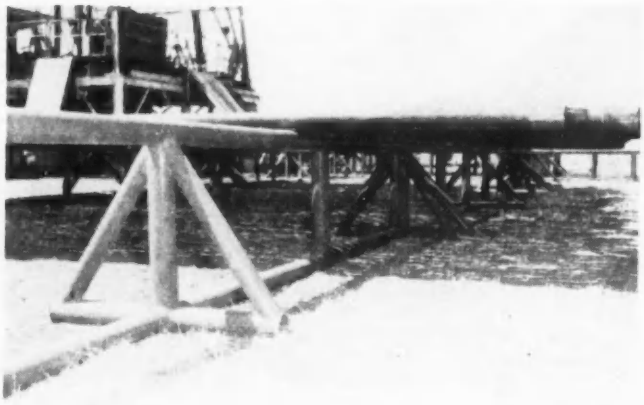
Rack Constructed Of Old Drill Pipe



A sturdy, easily moved pipe rack made of discarded drill pipe can be so designed that many location layout plans can be followed out.

The illustrated rack is constructed of 4½- and 3½-inch drill pipe welded together. A frame, of truck bed height, is formed with the 4½-inch drill pipe. The length of the frame is a matter of the operator's convenience. After the frame is constructed, three horizontal supports are cut for each rack segment and welded to the center and end legs. It will be noted that the center support is made with two sections of drill pipe while the end sections are just one length.

Special precautions in welding the high carbon drill pipe will greatly increase the ruggedness of this structure. For example, pre-heating the pipe before welding it; wrapping the newly made welds with asbestos to slow cooling, etc., will virtually eliminate the cracking of welds.

After the horizontal supports have been welded in place, 3½-inch diagonal supports are cut and welded to the 4½-inch legs and ground support.

Although the pipe rack will not fold for transport, the rugged construction permits handling heavy pipe loads and, at the same time, it is possible to carry several of the rack units on one truck.

Inexpensive to construct and capable of supporting great loads, these pipe racks eliminate the hazard of the rack collapsing when in use.

One of the advantages of this assembly is that its base construction will encompass sufficient bearing surface to eliminate the need for sills, except in marshy terrain.

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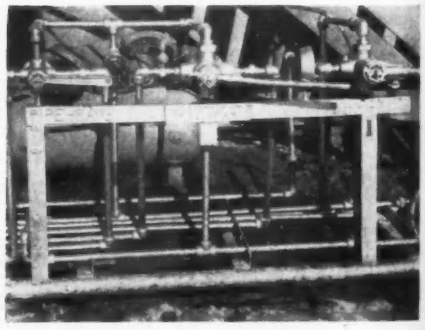

Unitized Controls Operates Devices

Controls for operating pipe rams, master gate and blowout preventers are mounted as a complete unit on a substantial steel frame for ease in setting and operating the various devices. The sills are made in the conventional skid type, or sled runner style, for towing after the unit has been unloaded. All piping within this mani-

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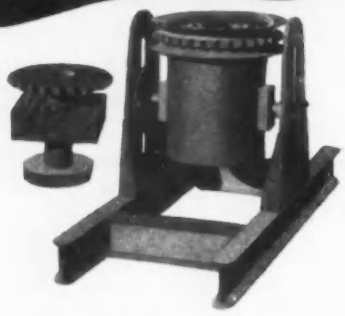

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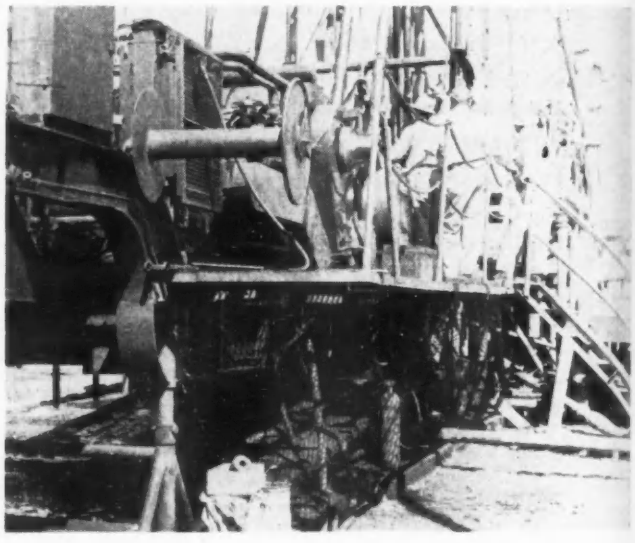
fold is held snugly to the cross members with "U" bolts or other effective tie-downs. Pipe unions at each end of this manifold provide means of connecting the supply line and the various distribution lines leading to the rig. Each important valve is labeled with letters run onto the top rail by the welder who lays the permanent welding rod. Thus the lettering is permanent for as long as the unit is operating. This unit is highly regarded by the drilling crew, as it saves time when rigging up. It is always installed at the same relative position at the rig where it is accessible in an emergency.

Ramp Supports Portable Rig



Moving a tractor towed portable drilling rig into position for operating against the platform or derrick floor has been simplified with a ramp built especially for this job. The ramp is made of timbers with a low angle of approach so that the rig can be backed easily up the grade. The end of the ramp at the hole to be drilled, or the well being worked over, is the highest point, and is made horizontal as a foundation for the twin axles of the machine. With this type ramp, the rig is automatically raised to operating height without building cribbing at each location. The forward tapered end is also brought to a horizontal pitch long enough so that the screw jack leveling device can be set up without laying further cribbing.

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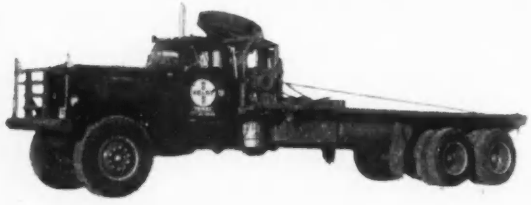

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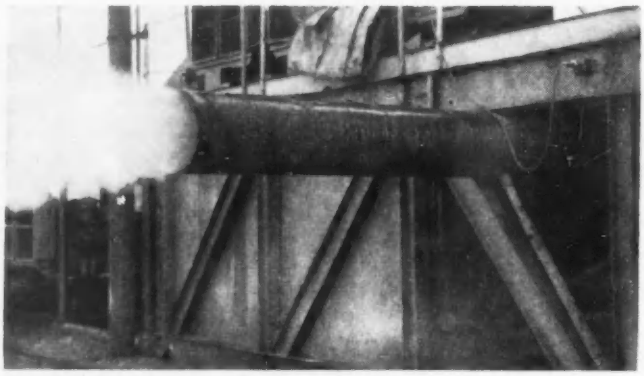
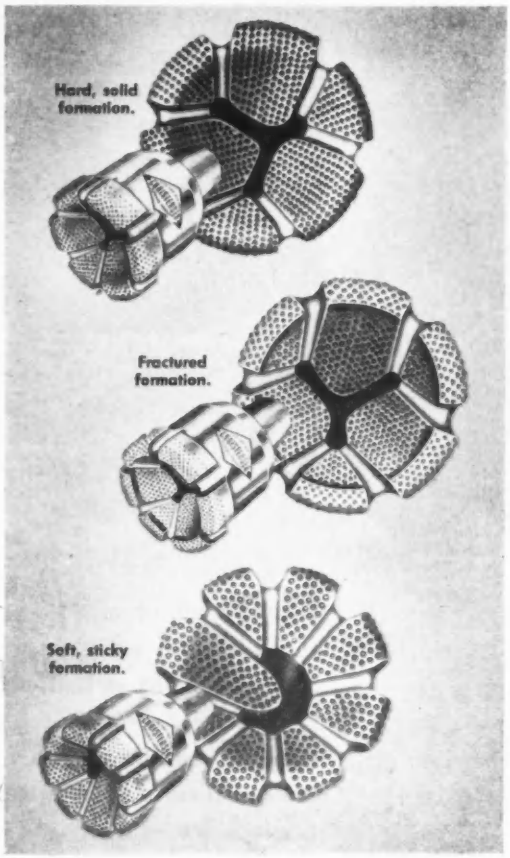
Exhaust Line Cuts Rig Up Time

Rigging engine exhaust lines so that all engines discharge into a single conductor pipe makes it possible to unitize exhaust lines into the sub structure, and reduce exhaust noise around the rig.

In the installation shown, a single, large diameter pipe



projects out from the side of the rig about ten feet. A telescoping brace, resting in the "V" between a column and diagonal brace in the substructure, holds the line firmly against the opposite "V" in the structure. The large diameter pipe effectively muffles the exhaust and generally reduces the noise level around the rig. In addition, with all exhaust going through a single pipe, installation and control of a water circulating system is facilitated.



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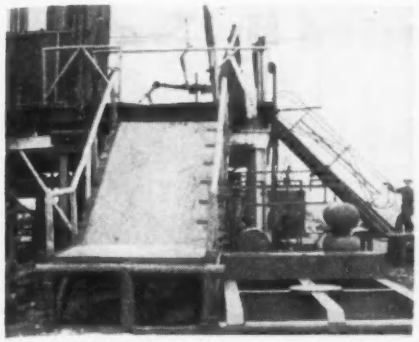
This Counter-Weight Holds Finger Bars

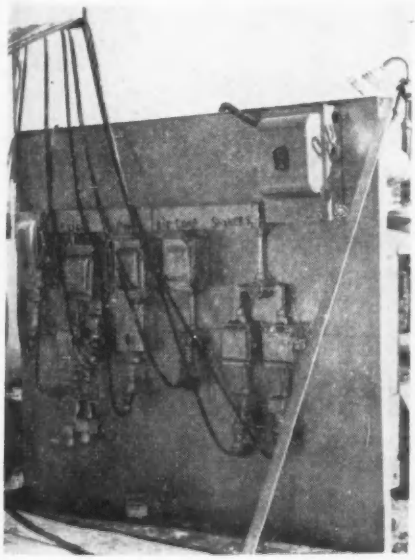
A counter-weight which automatically holds individual finger bars to the side of the derrick until the derrick man is ready to fill the current finger with drill pipe is an innovation which eliminates the need of lashing the individual finger bars. After filling the first finger the succeeding fingers are grasped by hand and pulled down into horizontal position to be filled. In reverse, as the pipe is run in the finger bar automatically returns to its original vertical position when relieved of its load of pipe.

The counter-weight is similar to a window sash weight and is heavy enough to bring the finger bar to its vertical position, but not so heavy as to require an extra hard pull by the derrick man when the finger is to be brought to its working horizontal position.



An Auxiliary Ramp Proves Multi-Purpose

Instead of building a tool dock at the side of the pipe rack where men must sort out the various tools required, a separate ramp can be placed at the corner of the derrick. Here suppliers of rock bits and the like can unload easily without unnecessary lifting of heavy equipment. Men on the floor can descend the ramp along the cleated walkway to attach the cat line to the tool required and quickly pull it to the floor for immediate use. The outer end of the ramp is flat for temporary storage, and the entire unit is floored with tank steel to expedite movement of tools. It is built with supporting legs so that it is not necessary to attach the upper end to the sill of the rig or to the timbers of the derrick floor.



Permanent Electric Switchboard Practical

A switch board can be built which contains all the necessary outlets for operating the electrical equipment of the drilling rig. The panel is a safety approved type set into an angle-iron

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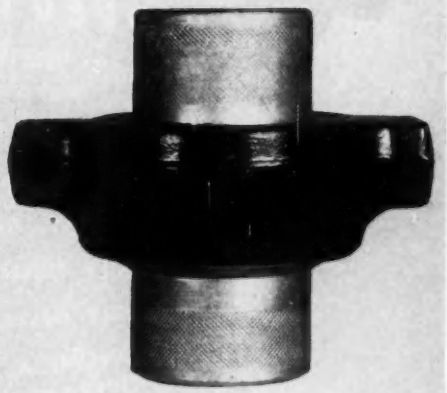
Fig. 600 UNIONS



This Union is ideal for pump manifolds – blowout preventer lines – mud lines – stand pipe connections – high pressure separator lines and other high pressure connections.

The replaceable bronze seat prolongs its use far beyond the normal service life of ordinary unions. It assures a seating surface unimpaired by rust on lines involving condensation.

For maximum service – longest life, specify WECO FIG. 600 UNIONS.

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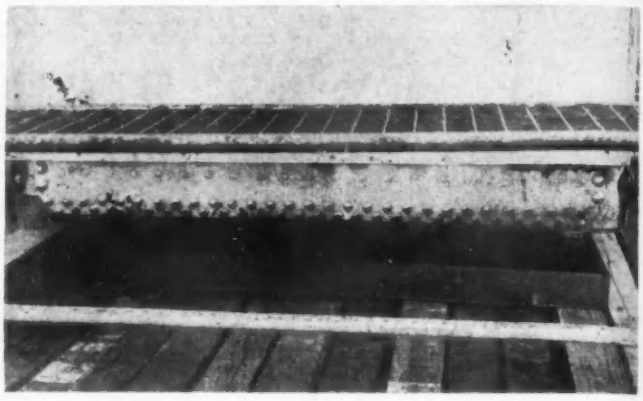
frame resting on a wide steel foundation fitted with wooden steps for the convenience and safety of employes. The main switch box is at the upper right hand corner and contains the master cable leading to the generators. Vapor proof outlets are arranged in sequence and lettered so that a novice may make the necessary plug-ins for lights, air compressor and the shakers, as well as other units operated by electric power. As all of the cable leading from the switch board to the power driven units is cased in extra heavy insulation, it may be hung safely on a davit-type bracket at the upper left hand corner of the board to prevent damage by abrasion which would probably occur if the cable were lying on the ground.

Fire Box Mat Protected By Tray



Placing steam boilers on wood matting creates the danger of burning the matting under the fire box. The hazard is more pronounced when there is a possibility of crude or condensate feeding through the separator and reaching the boiler burners. If this happens, the burning crude or condensate will fall on the matting and might burn out under the boiler beams, stressing the connection system.

To eliminate this condition, one operator built shallow metal trays which are filled with water and placed immediately under the fire box. With this provision, the danger of the matting catching fire and throwing the boiler battery out of plumb is virtually eliminated.

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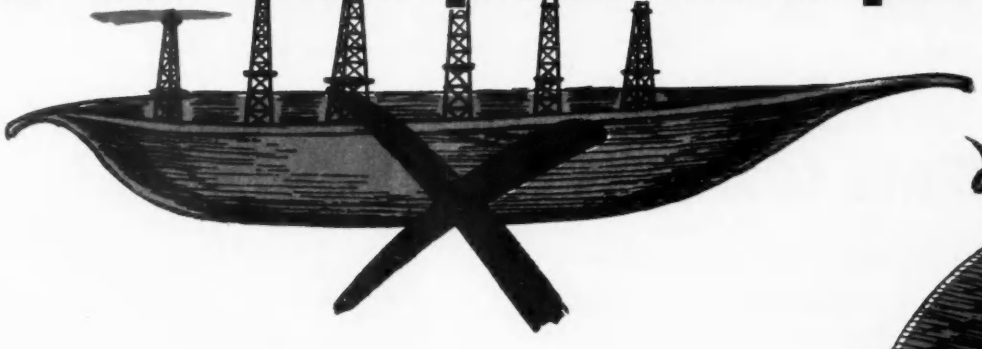

From the time you start rigging up until the well is completed, most of the problems you run into require a little different solution from previous ones. When that problem is coring, straight hole drilling, washover, whipstocking, or window cutting, it will pay you to call in your nearest Drilling & Service Engineer for recommendations on the correct Drilling & Service equipment for the job. Cost and performance records from all over the country prove that Drilling & Service equipment is the easiest, fastest and most economical solution to these problems.

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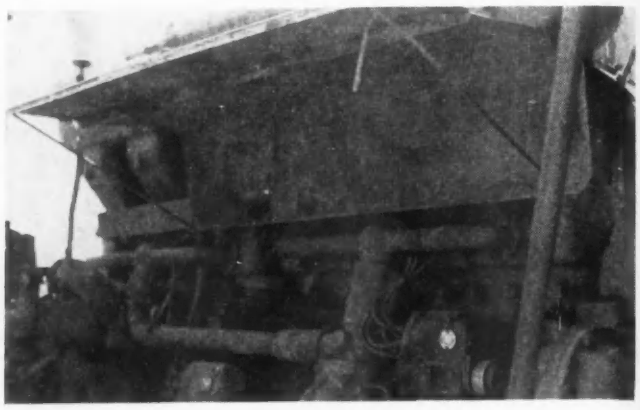
and a couple of non-returnable oil drums. One drum is cut off just above both rolling ridges at the one-third point so that the bottom two-thirds of the drum retains the ridges intact. A second drum is cut in two at the midsection, and a cone shaped piece welded to one end. The cone apex is truncated to produce a flat bottom approximately six inches across. The other end of the barrel is left open by cutting away the head at the chime.

Fixed to a standpipe is a bull-head tee at the bottom which rests on the base of the inverted truncated cone. A one-inch pipe nipple attached to the standpipe with a tee, extends through the top barrel slightly below the base of the inverted cone. It carries fittings to be attached to the flow line between the mud mixing pump and the mixing tank. A second tee running with the side opening of the stand pipe at its top extremity, carries a second piece of pipe. This pipe extends through the side of the top barrel slightly below the top rim. It carries a gate valve at the outer end. The top tee contains a common c.i. plug for closing. Dry material dumped into the top drum is drawn away by the vacuum created by the flow of mud, and this vacuum is controlled by the amount of opening made on the small gate valve. Wide open, there is no withdrawal, and any degree of feed may be obtained by gradual closing.

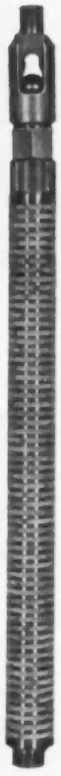
Portico Protects Magneto Ignition



Most engines with magneto ignition are not equipped with rain shields since protection is usually supplied with sheds or auxiliary buildings. When engines driving mud pumps are operated in open air, the ignition units can be protected with a metal shield, or type of portico without collonade. This shield is made of light sheet metal hinged to a bracket attached to the side of the engine above the magnetos. Rods are connected to this bracket at each end of the cover to operate as supports when the cover is elevated, as in fair weather. If a rain storm is expected, the supports are unhooked so the shield will hang downward well below the units which then are never shorted out by moisture. When the engine is ready to be loaded on a transport truck, the shield is lowered to prevent physical damage to the ignition and remains in this position until rigging up is completed. The shield is left in a lowered position or raised at the convenience of the rig mechanic.

ACCURATE COST FIGURES

. . . are hard to get, but here's what many production men, all over the oil fields, tell us:



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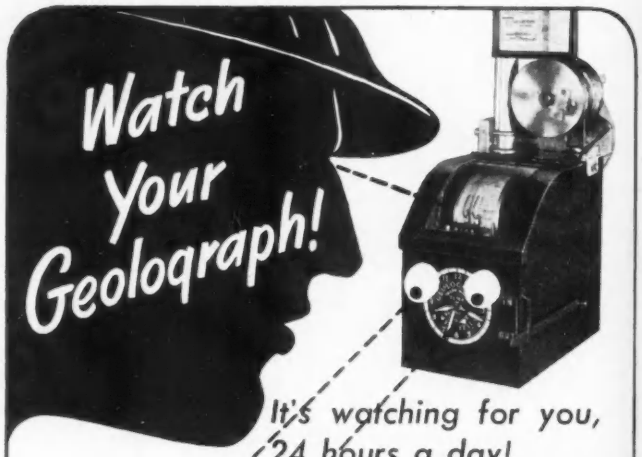

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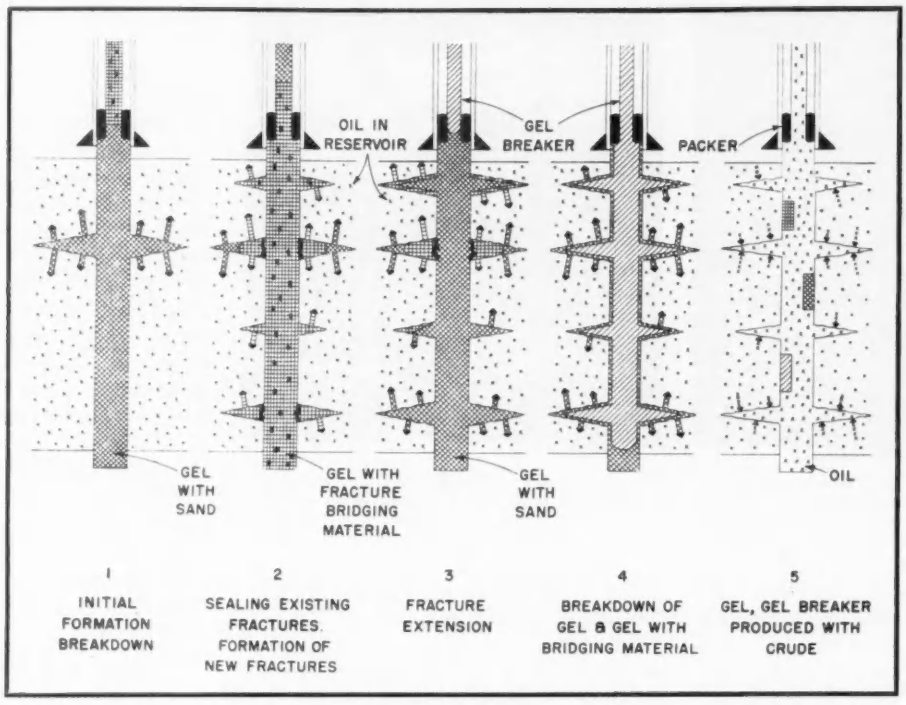

FIGURE 1.
Multiple hydraulic fracturing method.

Here's an ingenious technique to stop up old fractures so new ones can be made. Recovery is increased by . . .

New Multiple Fracturing Process

By GEORGE HOWARD and WILLIAM G. BEARDEN
Stanolind Oil and Gas Company, Tulsa

MULTIPLE FRACTURING OF formations is a further improvement in the original fluid fracturing method already proven in field applications for increasing the number of flow channels into the well bore and thereby reducing the fluid flow resistance. In multiple fracturing, a single fracture is created and then plugged at its face on the well wall by introducing into the fracturing fluid a suitable plugging material to prevent further penetration of the fracturing fluid into the crack.

By so restricting the fracturing fluid to the well bore, it is then possible to increase the hydraulic pressure in the hole to some higher value, at which another fracture occurs at some other elevation where the fluid seal on the well bore is not so complete, or where the rock is markedly weaker than at other depths. Each

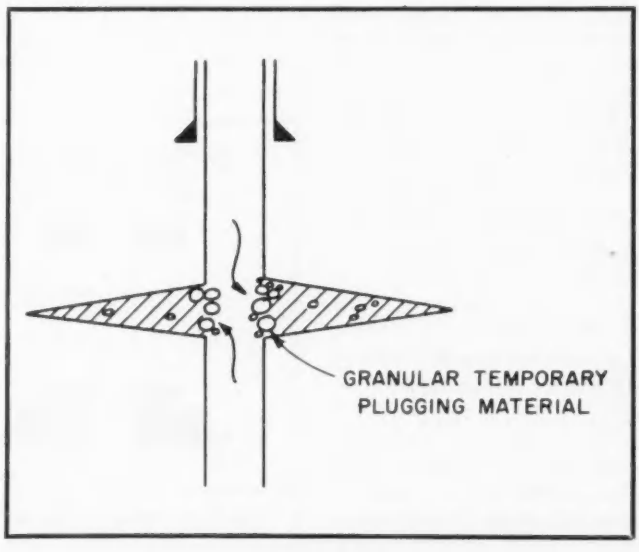

FIGURE 2.
Surface bridging by granular temporary plugging agent.

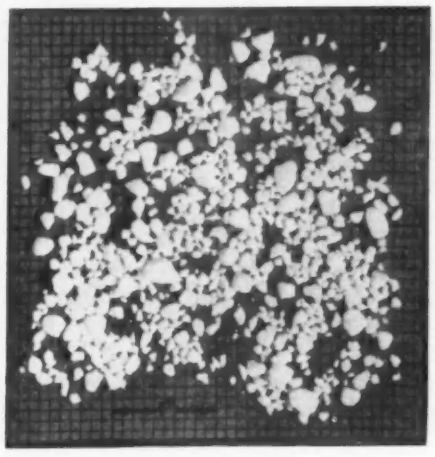

FIGURE 3.
Granular temporary plugging agent used in multiple fracturing.

FIGURE 4.
Addition of temporary plugging agent to transporting fluid.

fracture, so formed, is extended with a viscous liquid containing no plugging material.

Thus, by repeating this procedure, i.e., sealing successively formed fractures with a suitable plugging material which allows the imposition of sufficient pressure to fracture other portions of the formation, it is possible to create multiple fractures in any one isolated section of the well.

The napalm gel used as the fracturing fluid for the hydraulic fracturing process in sandstone, and the thickened acid used as the fracturing fluid for the hydraulic fracturing process in high solubility carbonate rocks both have proved satisfactory as a transporting media for the plugging material used in this multiple fracturing method.

This allows the multiple fracturing method to be adaptable to all types of producing formations and allows it to be used in conjunction with each of three variations in the single fracturing method. That is, by selecting the composition of the transporting and fracturing fluids, this multiple fracturing method can be used to treat sandstones, and both high and low acid solubility carbonate rocks. The terms transporting and fracturing fluids refer to either napalm-hydrocarbon gels or thickened acids, depending upon the type of formation being treated.

Key Points

Two key points on which the success of the multiple fracturing method depends are:

- Effective sealing of the previously formed fractures with a plugging agent sufficiently strong to allow the imposition of much higher pressures at other sections of the formation being treated.
- Removal of the plugging agent upon completion of the treating operation to allow free flow of the formation fluid into the well through all of the fractures created. The presence of these multiple fractures results in a greatly reduced resistance to the flow of fluids to the well bore.

The plugging agent must meet two major requirements. First, it must have physical characteristics such that it will effect a relatively impervious seal of existing fractures. Evaluation work on the various plugging agents indicated that the granular type additive is more effective than either the fibrous or lamellated type in restricting the pressure to the well bore, due primarily to the fact that this type material tends to seal on the surface or at the face of a fracture.

This sealing or bridging, illustrated in Figure 2, is accomplished by the larger size particles bridging at the opening of the fracture and the smaller particles bridging on the larger particles until a seal is accomplished.

Second major requirement is that it should be temporary in nature so that after the treating operation is complete, the plugging agent will not restrict the flow of formation fluid through the fractures so created. Among the other factors which must be considered are effect of temperature and pressure, and the melting point and solubility of the plugging agent. The material most commonly used at the present time which meets both of these requirements is compressed and ground pellets of naphthalene which are completely soluble in crude oil after a predetermined length of time. Figure 3 illustrates the particle size of the naphthalene as currenty used, and Figure 4 shows this material being added to the transporting fluid in a typical field operation.

To fit multiple fracturing operations closer to widely varying well conditions, two broad types of treatment are used.

Single Batch Multiple Fracturing

The single batch version is a method of creating multiple fractures in a formation and consists of plugging previously created or existing fractures with a thickened oil or acid containing a suitable temporary plugging material. This is shown as Step 2 on Figure 1. Step 1 of Figure 1, shows the creation of a fracture or the extension of an existing fracture by any of the single fracture methods previously described.

Creation of additional fractures with any of the single fracturing methods previously described is shown as Step 3 of Figure 1, while Step 4 of Figure 1 shows the injection of a "breaker" solution to expedite the viscosity reduction of the fracturing fluid.

Fifth step of this treating procedure consists merely of placing the well back on production to flush the treating fluids from the formation.

This type of treatment is particularly applicable to wells having rela-

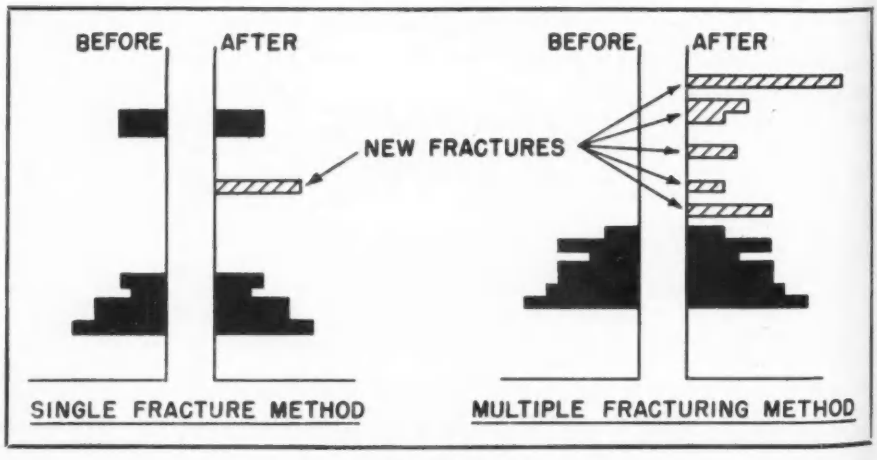

FIGURE 5.
Profile of permeable zones before and after typical hydraulic fracturing treatments.

tively short producing sections or producing from formations having relatively low, uniform resistance to the flow of oil. Under such conditions, only a few fractures are generally required to drain effectively this type of reservoir. By altering the composition of the transporting and fracturing fluids, both sandstone and all types of carbonate rocks may be treated.

Of the five wells treated as of March 1, 1952, with this version of the multiple fracturing method, four wells have responded with sustained production increases; one well failed to respond, due apparently to a nonproductive formation. A typical treatment by this method resulted in 250 percent more oil production.

Multiple batch multiple fracturing is a method for creating a series of fractures in a formation and consists of producing a fracture in the formation by any of the previously described methods, then sealing that fracture by injecting into the well a suitable temporary bridging agent suspended in a carrying medium, followed by a relatively low-penetrating and/or high viscosity fracturing fluid to form the second fracture. This process is repeated as many times as desired to accomplish the number of fractures needed.

Operations of this type are particularly applicable to relatively long producing sections, or to producing formations having a high resistance to the flow of oil. Generally, a large number of fractures are required to drain effectively this type of formation. As with the single batch multiple fracturing method, this procedure may be used in any type of producing formation by altering the composition of the transporting and fracturing fluids.

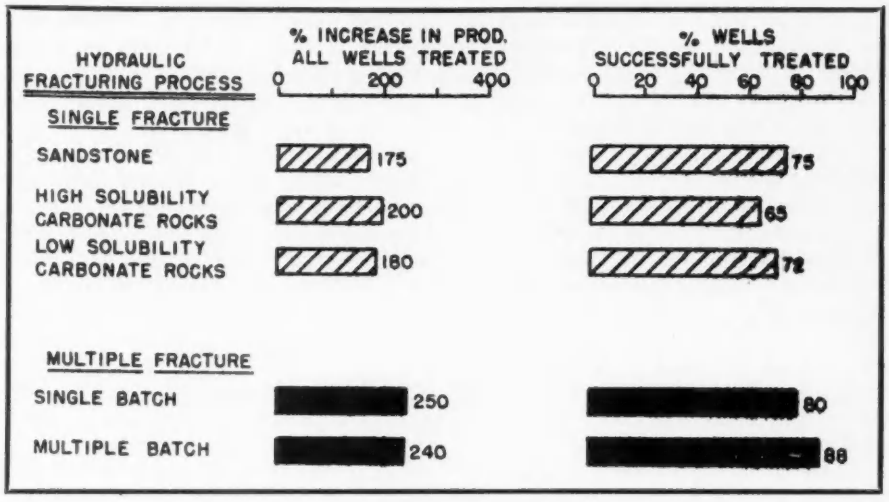

FIGURE 6.
Effect of hydraulic fracturing operations on well production.

As of March 1, 1952, this method of hydraulic fracturing has been used in approximately 25 wells. Of these 25 wells treated, 22 have responded with sustained production increases for a success percentage of 88 percent. A typical treatment by this method will result in an average of 240 percent more oil production.

Results

Figure 5 presents the results of two typical well surveys conducted to determine the location of the more permeable zones of a producing formation before and after both single fracture and multiple fracture treatment. These surveys were conducted by injecting oil into the producing formation and measuring the amount of fluid being displaced into each zone. This measurement is made by lowering into the well an instrument containing a propeller.

As the injected fluid is forced past the instrument, the fluid velocity causes the propeller to rotate. By measuring the rate of rotation of the propeller and correlating this with the diameter of the well, the volume of fluid entering the formation at any point may be computed. The profile on the left shows one fracture created by the single fracture method of the hydraulic fracturing process. The profile on the right illustrates the results of the multiple batch multiple fracture method in which five new fractures were made.

Figure 6 presents a summary of the results obtained from each of the variations in the basic hydraulic fracturing processes. From this figure, it appears that multiple fracturing not only tends to increase the frequency of success, an average of 84 percent for multiple fractures versus approximately 70 percent for single fracture, but also tends to greatly increase the wells productive capacity, as evidenced by an average increase in production of 245 percent for multiple fracturing as compared to an average of 185 percent for single fracture methods.

The question that has been frequently asked is, "Do fracturing treatments result in a sustained production increase and if so, does the extra production represent an increase in the proved oil reserves or is the same amount of oil merely recovered more readily?"

Ability of the hydraulic fracturing method to effect a sustained production increase is illustrated in Figure 7. An analysis of this figure shows that at the end of six months 75 percent, or 45 of 60 wells on which data were available showed a sustained

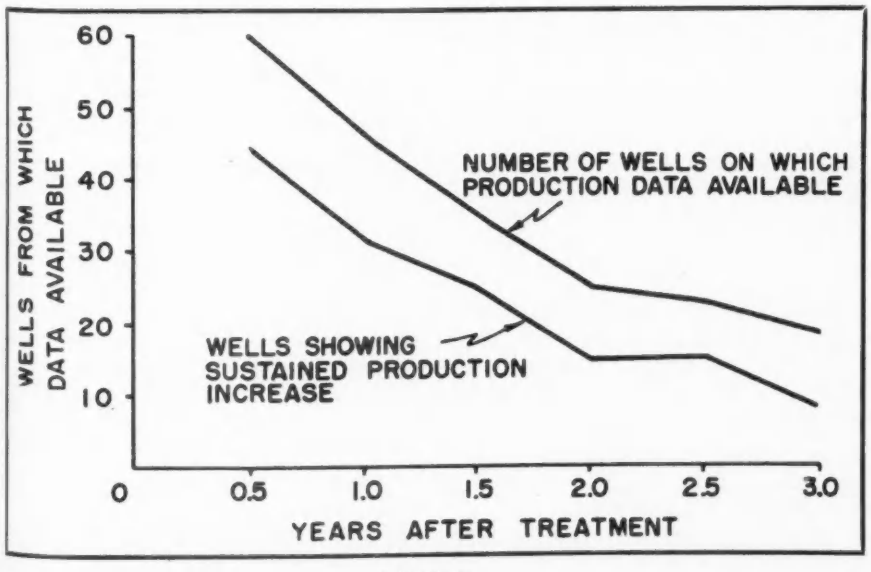

FIGURE 7.
Production sustained after hydraulic fracturing.

production increase. At the end of two years, data were available on 25 wells. Of these, 15 wells, or 60 percent, showed a sustained production increase. At the end of the three years, 55 percent, or 10 of 18 wells had a production rate greater than before hydraulic fracturing treatment.

Lack of information on additional wells at the end of the third year is primarily a result of the small number of treatments conducted in the early stages of field application of this process. Production data on wells treated more than three years ago are limited to so few wells that they were not considered.

These data would seem to indicate that the hydraulic fracturing process is capable of effecting a sustained production increase for long periods of time following treatment.

Answer to the question, "Does hydraulic fracturing increase the recoverable crude oil reserves or does this process merely permit the production of the original recoverable oil in a shorter period of time?" can best be demonstrated by referring to Figure 8.

Well A of Figure 8 illustrates the type of hydraulic fracturing treatment that results in only a limited sustained increase in production. However, even in wells of this type, the shaded area represents oil that would not have been recovered by the time the well reached its economic limit had not the hydraulic fracturing process been applied.

Well B of Figure 8 shows a typical plot of a production decline curve on a well showing a sustained increase in production. In wells of this type, as compared to Well A, the amount of extra oil recovered by reason of the hydraulic fracturing treatment is usually considerably larger.

For example, a well similar to Well B, in the Witcher field, Oklahoma, is expected to produce 8500 barrels of additional oil over and above that which would have been expected to be recovered had the well been allowed to experience its normal production decline. The amount of extra oil recovered from wells similar to Well A may vary from a few hundred to several thousand barrels. Thus, it may be seen, based on the data available, that the hydraulic fracturing process is not only capable of effecting a sustained production increase on a large number of the wells treated, but in most instances, actually results in a considerable increase in the amount of recoverable oil in any reservoir.

In some instances, such as the development of the Spraberry Trend, economic producing rates were impossible to attain without production stimulation by the hydraulic fracturing process. When considered in terms of the 9360 wells treated with variations of the process during its first three years of commercial operation, this extra or additional recoverable oil becomes an important factor in the nation's oil reserves.

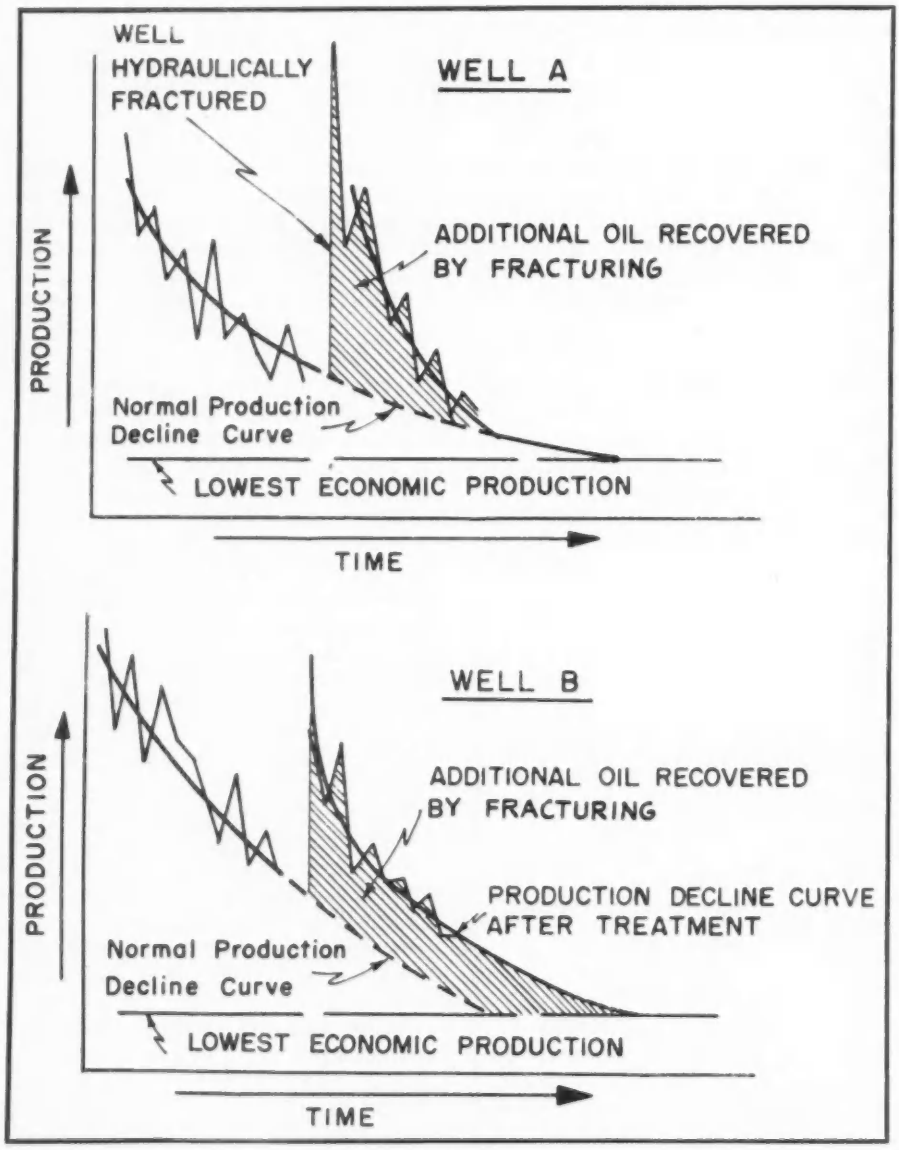

FIGURE 8.
Additional oil recovery by hydraulic fracturing.

Future Development

Since the original concept of increasing the productivity of oil or gas wells by hydraulically fracturing the producing formation, there has been a continuous stream of new ideas. Some of these have become commercially available and have been briefly discussed while others are still in the laboratory stage of development.

There are many ideas in various stages of development and indications are that the next few years will see major improvements in the hydraulic fracturing process as we know it today.

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Axelson "TLE" (Tubing Liner) Pump shown. There is an Axelson Deep Well Plunger Pump for every specific well condition.

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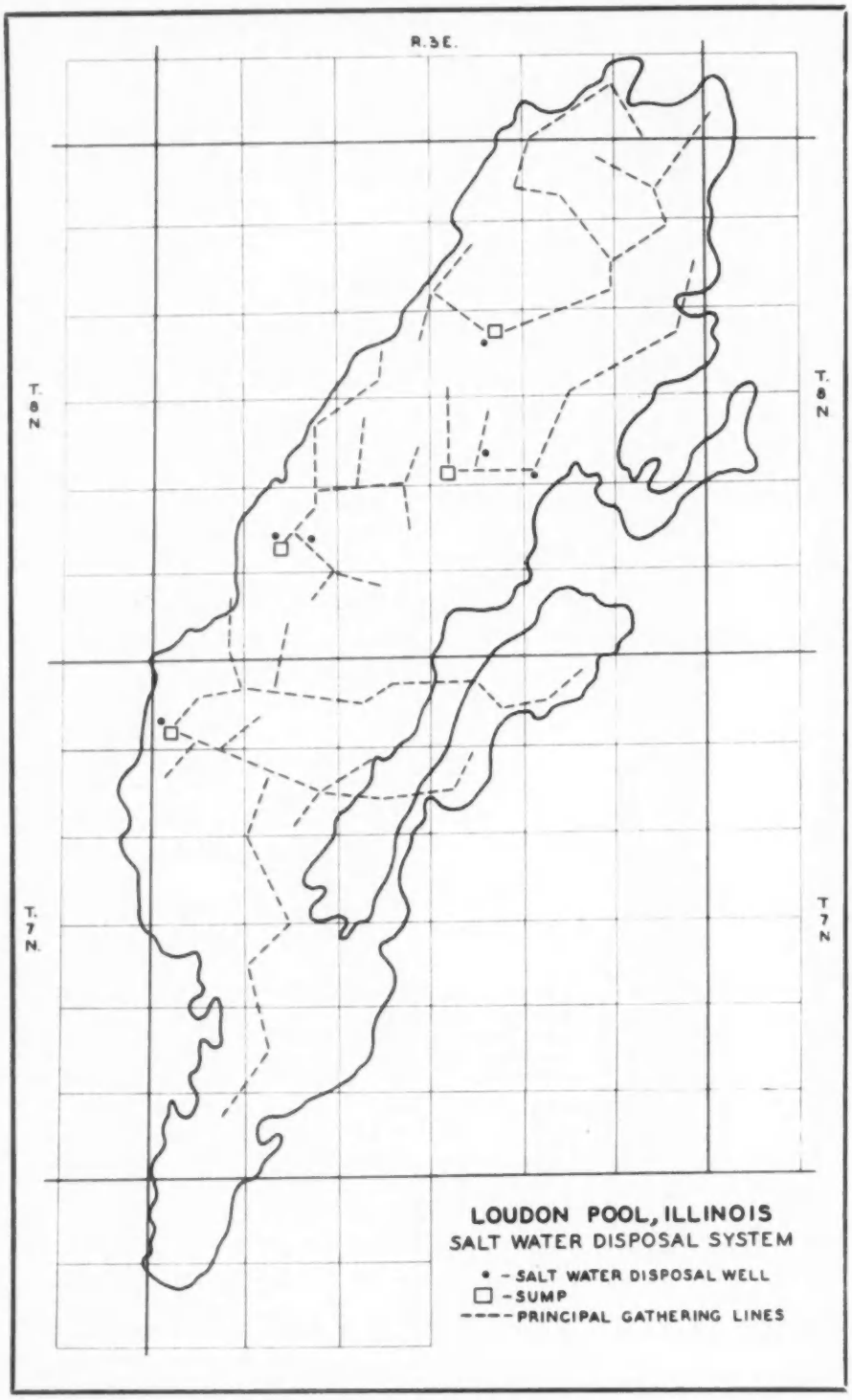

Layout of The Carter Oil Company's salt water disposal system at Loudon pool, Illinois.

28,000 Barrels of Brine Disposed Daily in Six Wells at Loudon

Nearly 75 miles of line, four collecting stations serve 16,500 acres of oil leases.

By J. F. ARMSTRONG
The Carter Oil Co., St. Elmo, Ill.

COLLECTING, TREATING and disposing of about 28,000 barrels of salt water in six injection wells is done every day by The Carter Oil Company in the Loudon field of Fayette and Effingham counties in Illinois. Of the 1300 wells operated by Carter, some 250 produce salt water that is collected by nearly 75 miles of lines serving 16,500 acres of oil leases. Each system consists of collecting lines, gathering sump and injection equipment for sub-surface disposal of the raw brine.

The Loudon pool was developed between 1937 and 1943 and now contains about 1990 wells producing from the Chester sand at depths averaging 1500 feet, and from 74 wells in the Devonian limestone at depths of about 3000 feet. The Devonian wells are the largest salt water producers, although some brine is produced by the Chester sand wells.

System Layout. To take care of its salt water disposal problems, four open type gravity disposal systems were constructed. Brine was returned to the Devonian formation through six wells. In planning the original installation, estimates were first made of the amount of salt water expected to be produced from each lease.

These data were used to determine the line sizes and pump capacity. Aerial photos were studied and a rough survey of the area was made with elevations taken on individual tank batteries to select the most suitable location for the collecting sumps.

It was then possible to rough in the entire system by stadia and level to estimate the best route to be taken by each line culminating at the most adaptable sump location. From these field data, profiles were plotted to determine the practicability of the proposed routes. Wide valleys and ravines were avoided wherever possible.

In ordinary fluid flow, a gravity line may be laid between any two points of differing elevation so long as no intermediate point exceeds in elevation the hydraulic gradient of the line at that point. However, such a rule is not advisable in the construction of salt water disposal systems where relatively large quantities of solid precipitates tend to settle during static conditions.

At Loudon a minimum grade of one foot per 100 feet was established to minimize sedimentation. Pipe sizes were determined from head loss charts

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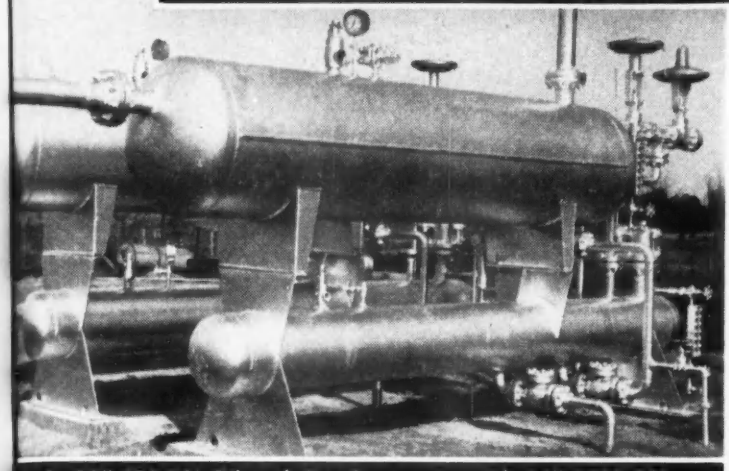
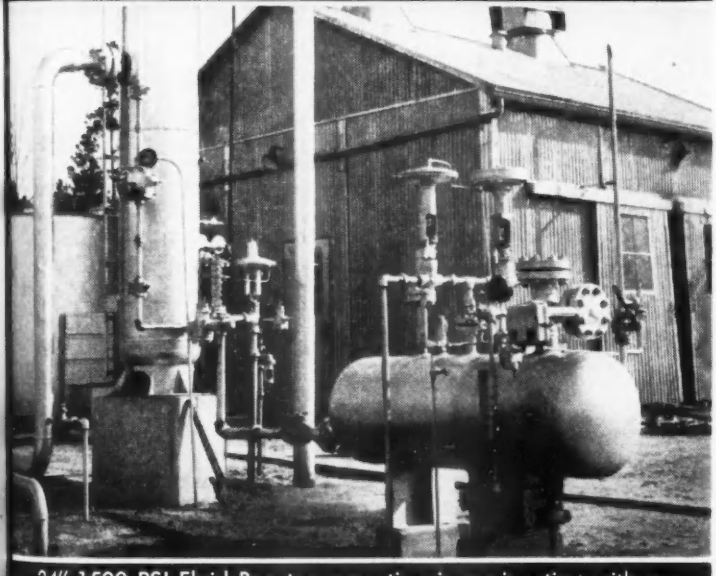


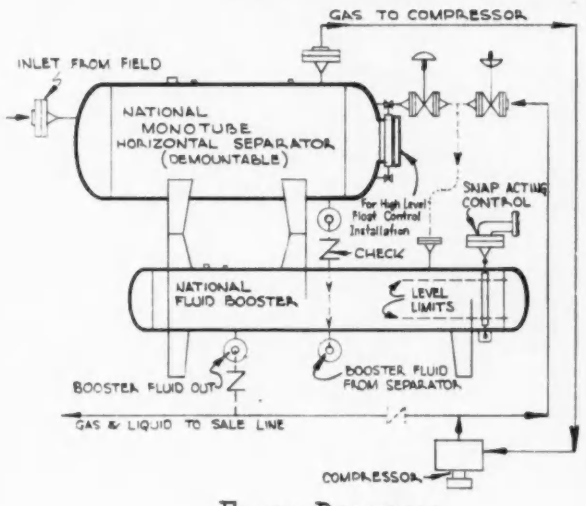
2—30" 500 PSI Oil and Gas Separators with 16" 1200 PSI BOOSTERS. Compressing gas at this site from 350 PSI to 1100 PSI.



24" 1500 PSI Fluid Booster operating in conjunction with a vertical Oil and Gas Separator and Gas Compressor.

30" 1000 PSI Oil and Gas Separator with 10" Water Leg and 24" 1500 PSI BOOSTER. Fluid is boosted from 800 PSI line into 1350 PSI line.

(Patented and Patents Pending)



FLOW DIAGRAM

APPLICATION

Usual application is in producing areas where well head pressures have fallen to a less pressure than the existing gas sale line pressure. Here the unit is used in conjunction with a gas compressor.

Typical of this situation is the Carthage Field in East Texas which is supplying gas to a 1050 PSI transmission and gathering line whereas the field producing pressures have fallen to 400-600 PSI.

OPERATION

The fully automatic unit operates as follows: The well product enters the separator where gas is separated and scrubbed of any entrained liquid. The liquid flows to the booster and gas flows to a compressor. When fluid level builds up in the booster to a prescribed level, a snap acting control opens and closes simultaneously the two valves in the line from the discharge side of the compressor. No gas is vented when double valving is used. Pressure equalizes on the booster with that of the compressor outlet. The liquid then flows from the booster and is comingled with the gas downstream of the compressor and flows then into the sale line.

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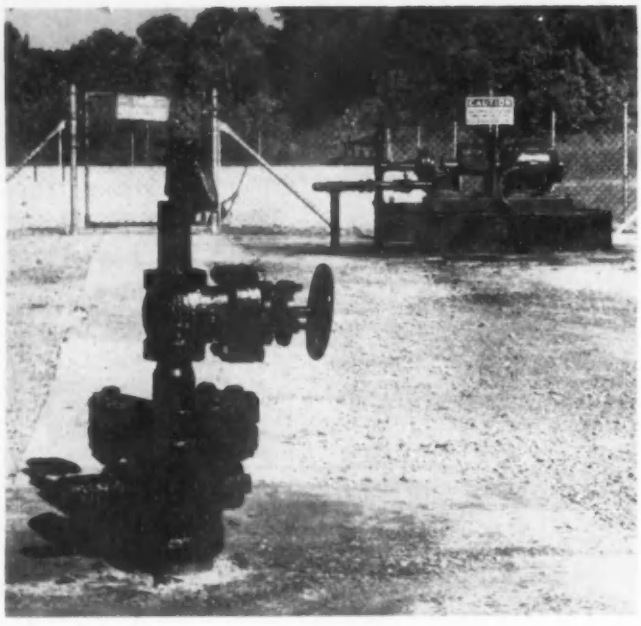
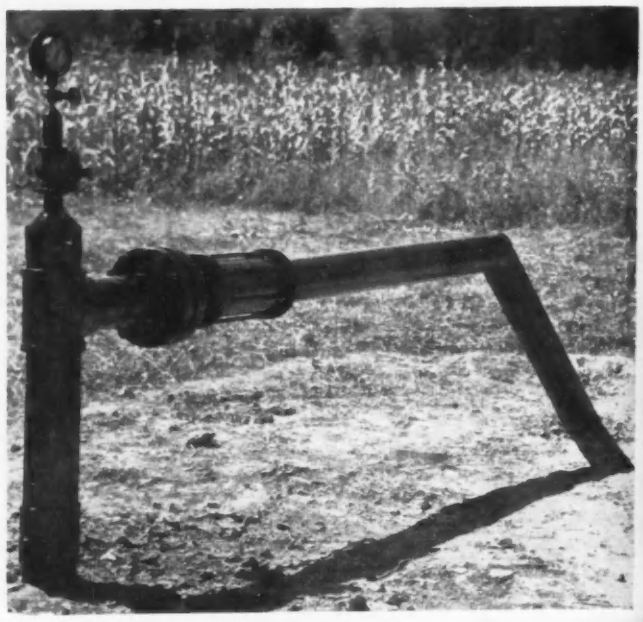


Salt water injection well, Carter's Quade lease, Loudon.



One of six salt water injection wells which return more than 28,000 barrels of produced brine to the subsurface from 250 producing wells.

based on expected maximum water load and flow characteristics for the type of pipe used. In all original installations vitrified tile pipe was used for gravity lines. The system was so designed that this pipe never ran full in order to eliminate any back pressure.

Collecting Sumps. In the design and construction of collecting sumps, the first step was to design a pit of sufficient volume to allow a minimum of 24 hours settling time for the maximum anticipated brine production. Depth of the pit was dependent on the depth of the gravity discharge, as a water level standing above this discharge would create back pressure on the collecting system. Dimensions of each pit were designed to minimize channeling.

Sumps were built with two equally-spaced partitions slotted approximately a third of the distance from bottom for skimming, with the middle chamber being partially filled with a graded gravel and sand bed for filtration. Subsequently the filter beds were removed to use this section for further settling space and this resulted in plugging of the filter section with no satisfactory method available for backwashing.

Concrete sumps are of monolithic construction, were never coated and show no signs of deterioration. Sump walls were built high enough to exceed high water mark during flood periods and injection pumps and prime mover foundations were also designed against flooding.

Pipe Lines. Construction of the salt water disposal systems included hauling, ditching, laying and backfilling all lines. Extreme care was taken in ditching operations and ditching to 0.01 foot was accurately accomplished. The tile pipe, which was used originally, being fragile and not to be subjected to rough handling, required extreme care in laying operations. To insure a positive contact between pipe and bottom of ditch, a layer of finely crushed earth was first laid with impressions for the tile bells.

Joints pre-assembled in groups of three were laid with the bells on the upstream end. Each joint was packed with jute and sealed with a hot bituminous compound which hardened to an inflexible joint. After the joint had set, fine earth was carefully tamped around the pipe to not less than half the pipe diameter and the ditch was then hand backfilled to not less than one foot above the pipe, with the earth being tamped at intervals. Backfilling was then completed with a bulldozer.

In more recent years tile pipe has been discarded as gravity lines and a coal tar base, fiber pipe used. This pipe is lighter and less fragile than the tile and comes in joints less than ten feet long. Joints are tapered at each end to fit machined collars of the same material. Ditching and laying procedures were similar as those for tile pipe except in making up joints. A coal tar paste compound was applied to the tapered ends and to the inside of the couplings. Joints were made up by striking the open end of the pipe protected by a heavy block of wood with a sledge hammer, care being taken that no further driving took place after the shoulders touched. After ditching the pipe, backfilling proceeded quickly especially where water might be present in the ditch, as water would cause the lightweight pipe to float. Where odd lengths were required for fitting, the fiber pipe was cut with a carpenter's saw and tapered.

Where higher brine temperatures existed at treater locations, the fiber pipe tended to get soft and become deformed. At such points, a cement asbestos pipe was laid capable of withstanding pressures in excess of the fiber pipe. The pipe was ditched and backfilled in the same manner as the tile pipe except in jointing. It was of constant diameter and joints were made up with parallel couplings and two rubber gasket rings. A ratchet type chain puller was used to draw the coupling over the two gaskets which were compressed and rolled

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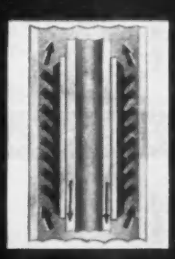
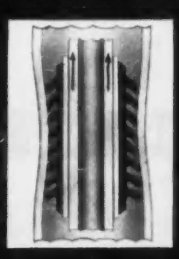
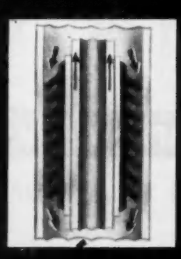


On the down stroke fins are in normal upturned position, allowing E-Z Swab to fall free.

Flexibility of fins allows EZ Swab to pass smoothly through tight spots on up or down stroke.





E-Z Swabs automatically by-pass fluid overload. Each rubber will lift approximately 400 feet of fluid. Rubber fins bend down and unload excess fluid.

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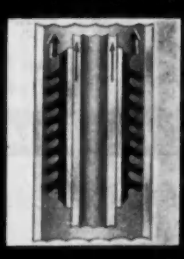

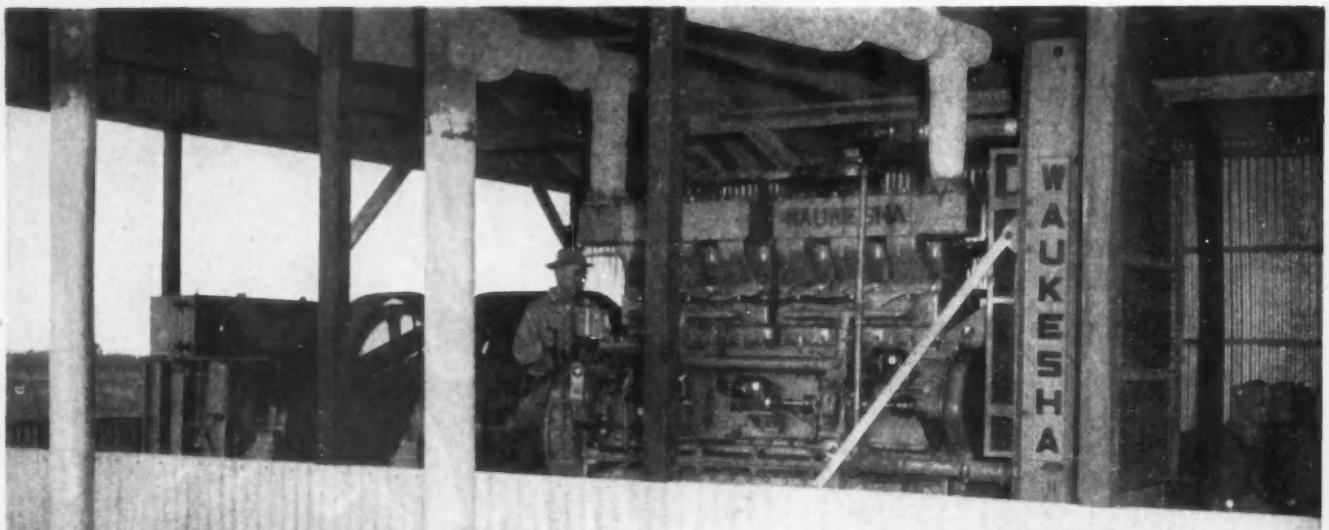

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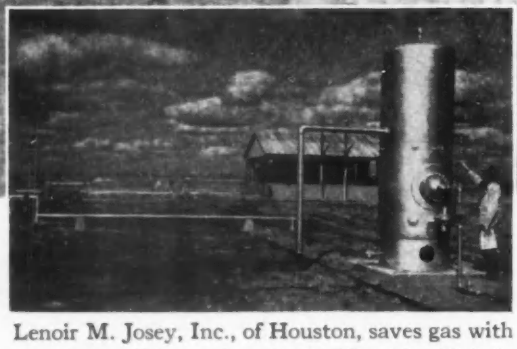

Lenoir M. Josey, Inc., of Houston, saves gas with closed gas lift on 5 wells in Hutchins-Kubela field, Wharton County, near El Campo, Texas.

A Waukesha 6-LROU, 6-cyl., 8½ x 8½, 2894 cu. in. unit powers pump in compressor plant shown. Inlet gas scrubber (*left*) surge "bottles" (*right*).

194

The new Model LROU Waukesha which you recently installed in our gas lift plant at El Campo, just "fills the bill". It has sufficient power to take care of the heavy loads when the suction is flooded with gas lift gas from the wells, yet it runs smooth during the periods when the suction is low and the load is off.

This is the third installation of Waukesha in our campaign to eliminate flare gas on leases in Texas. During the past year, we have spent nearly a quarter of a million dollars in conservation practices and Waukesha Engines have figured in every installation. This was prompted by our records showing long service life and low costs of upkeep on our Waukesha installations.

We have 38 Waukeshas of various models and ages on our producing leases. Many of these are 10 to 15 years old and we have never junked a Waukesha Engine. For this reason, we have standardized as near as possible on Waukesha Engines.

W. D. Carleton, Prod. Supt.
LENOIR M. JOSEY, INC.

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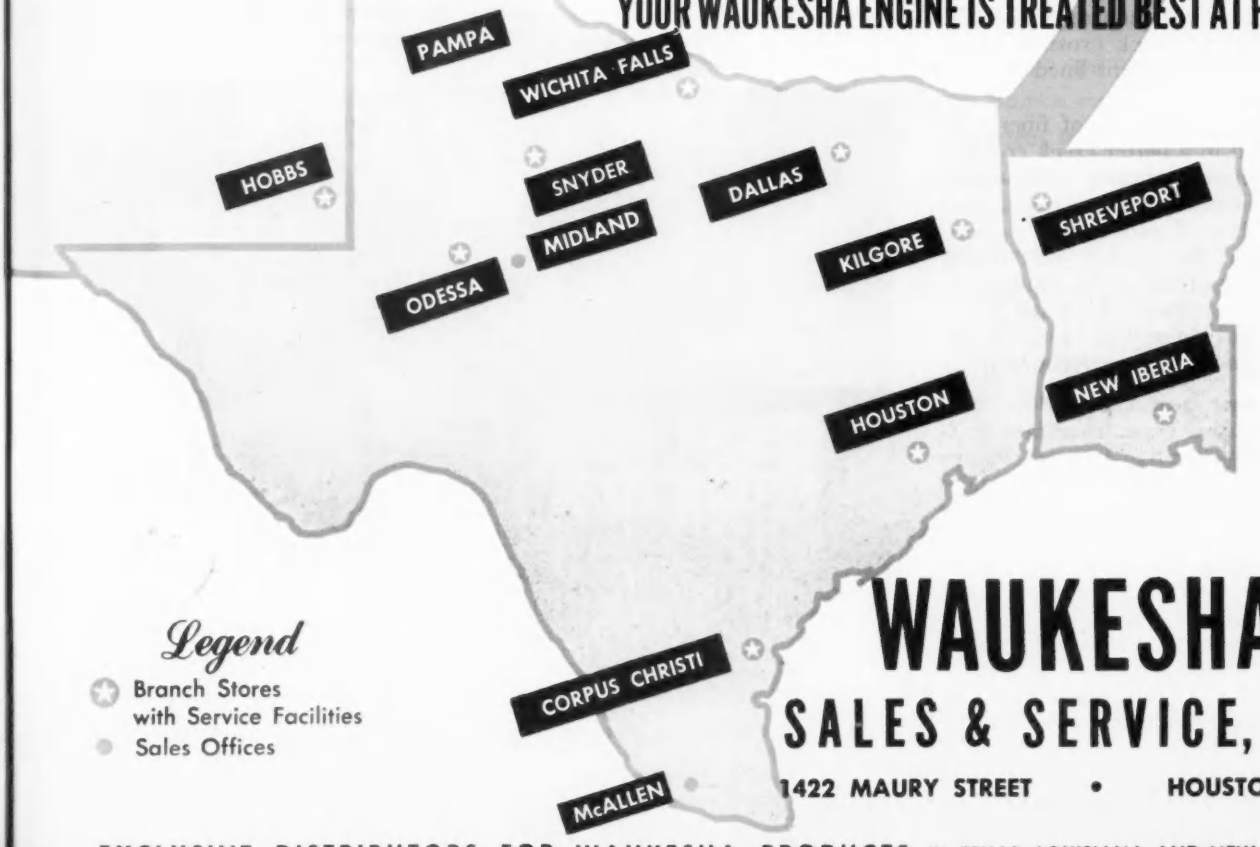

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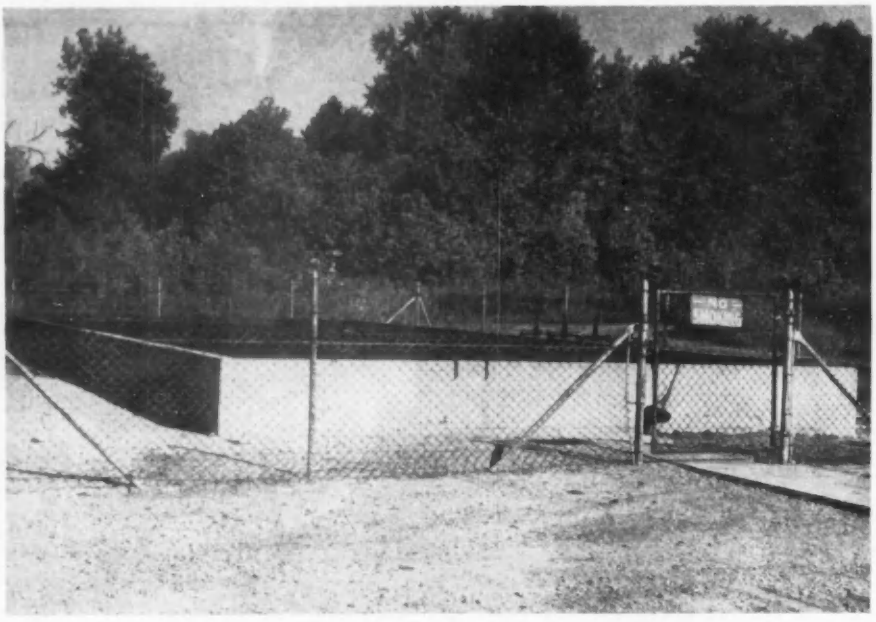


Typical salt water gathering sump, The Carter Oil Company salt water disposal system in Loudon pool.

into position approximately half way from, and on opposite sides of the joint. The resulting joint was extremely tight, yet somewhat flexible.

On injection lines and pump over lines where pressure pipe was required, cement-lined, or cement asbestos pipe was used, and there were no special problems of laying or backfilling. All joints were either threaded and coupled or flanged.

Where tile was originally used, creek crossings were laid in the creek bed regardless of grade. These crossings, built to conform with state requirements, were U-shaped with breather pipes on each riser to avoid air lock. These creek crossings were made of either cement-lined or cast iron pipe.

The more recent use of fiber pipe has resulted in a better creek crossing design. Where the state will permit, fiber pipe is now held on grade across creeks with steel casing used as conduit to span the creeks. Junk casing is also used as conduit for road crossings where shallow ditching and heavy loads would otherwise subject the fiber pipe to excessive overburden.

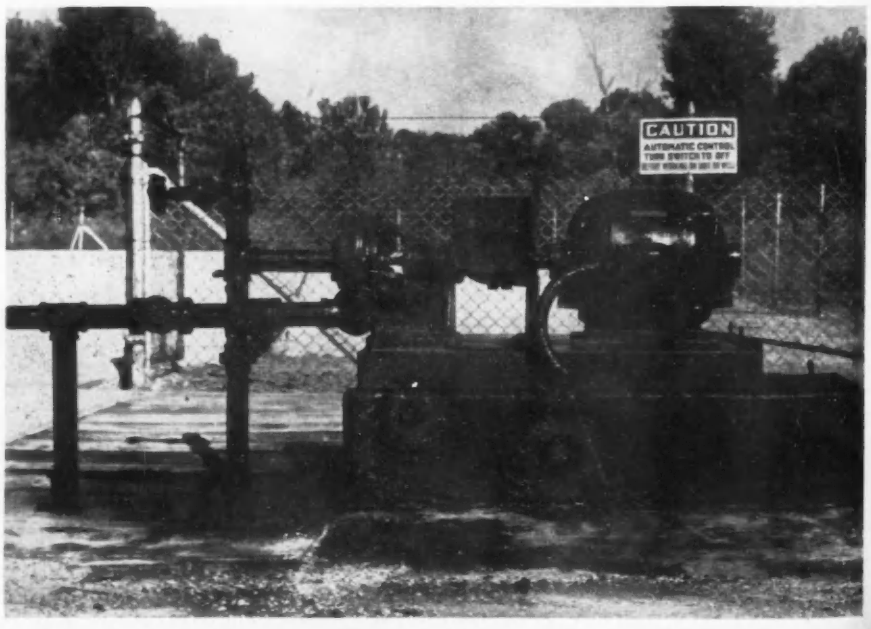
Equipment and Operation. Salt water is moved from lease tank batteries to centrally located sumps through a network of some 75 miles of pipe lines. Brine is collected almost entirely by gravity flow although short pressure lines at four small pump-over stations are necessary because of terrain irregularities. Vitrified tile line is used in 63 percent of the gravity lines, fiber pipe in 29 percent and the remainder is made up of cement asbestos, cast iron and cement lined pipe.

Since the system was installed, increases in the amount of salt water produced and deposition of solid precipitates have resulted in occasional pressure build-ups and subsequent failures. Remedial measures have included paralleling of some lines to increase capacity, replacement of damaged sections, patching where possible and frequent swabbing of lines most subject to deposition.

Gravity flow lines inherently admit air into the system and if it could be excluded it would materially reduce precipitation of solids as well as corrosion. However, it is felt the cost of a closed system for the area is too great and that it is more economical to adopt prompt remedial measures when conditions so require.

Pumps. Because of high anticipated injection pressures, positive displacement pumps were used on the initial injection installations. All reciprocating pumps were of the duplex type and rated from 88 gallons per minute at 350 pounds per square inch to 390 gpm at 520 psi. Input horsepower ratings ranged from 20 to 160. Lower injection pressures than those originally anticipated and larger volumes of produced brine resulted in the replacement of all but one of the positive displacement pumps with centrifugal pumps where volumes exceeded pump capacities or where increasing maintenance cost demanded. The one remaining reciprocating pump has not been replaced because of comparatively low maintenance cost and sufficient capacity.

Corrosion of pumping equipment has been effectively reduced by the use of bronze impellers in cast iron cased centrifugal pumps, and brass liners and pistons with micarta rings and phenolic valve plates on the reciprocating pump. Centrifugal pumps now in use include two 3 x 4-inch two-stage pumps rated at 329 gpm at 113 psi and one 1½ single-stage pump rated at 118 gpm at 36 psi. All the centrifugal pumps are electrically powered, and are automatically started and stopped by means of electrodes located in the sumps. The reciprocating pump is powered by a gas engine controlled by a float and counterweighted throttle. All pressure lines on injection service are cement lined, and the pipe fittings at the pumps are standard steel.



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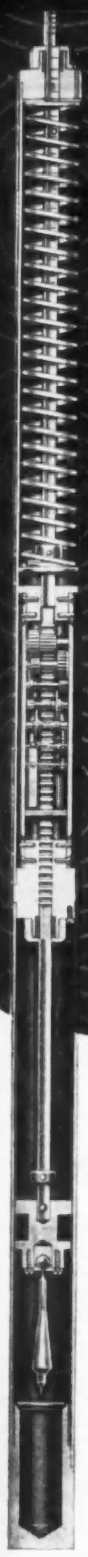

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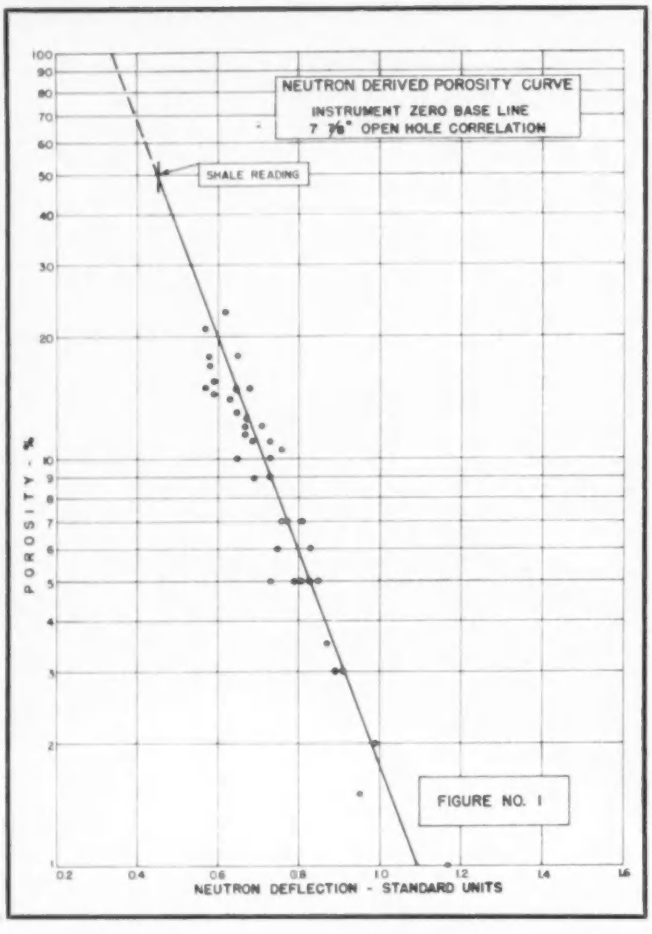

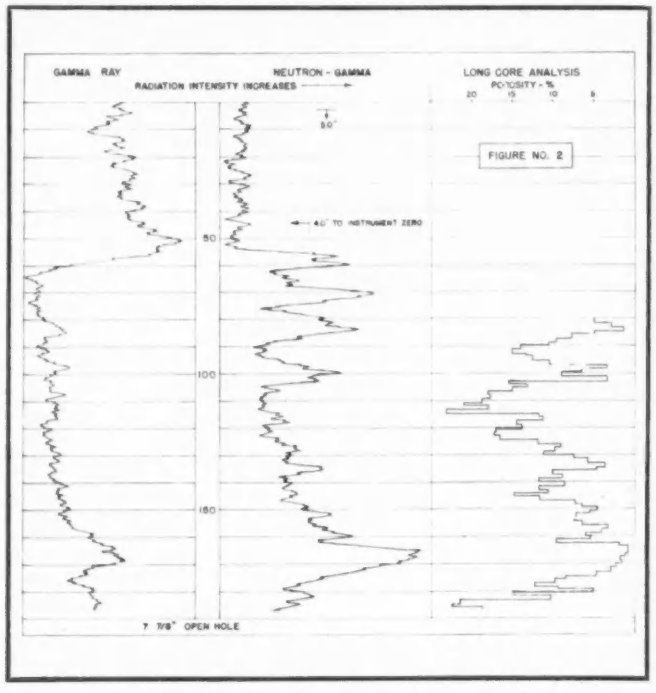

Neutron-gamma log of West Texas Canyon Reef and corresponding core analysis.

Logarithmic response of neutron gamma ray deflection with liquid filled porosity.

Hole Diameter Influences Neutron Derived Porosity

Here's the answer to the question—Just how accurate are porosity estimates based on the log deflection of neutron-gamma rays?

By C. B. SCOTTY and E. F. EGAN
The Texas Company,
Bellaire, Texas

EMPIRICAL CORRELATIONS are presented whereby neutron-gamma porosity correlations for open hole conditions may be calculated for various fluid filled bore hole diameters. Although the correlations were developed from the Canyon Reef of West Texas, they are applicable to other liquid filled formations substantially free of shale. The correlations developed are only valid for the commercially available neutron-gamma instrumentation as run at present.

Application of these neutron-gamma porosity correlations should provide a good means of estimating porosity in wildcat wells wherein the bore hole diameter is less than eight inches. In large holes, the influence of small changes in bore diameter materially influences the log; therefore, an accurate knowledge of hole diameter is required. Porosity interpretation in large bore holes is further hampered due to decrease in the neutron-gamma log response to changes in porosity with increase in bore hole diameter. This factor can be minimized by a more accurate determination of instrument zero.

The logging tool consists of a source of neutrons and a means of detecting and measuring gamma rays, the detector being shielded from the direct emission from the source. The gamma rays reaching the detector have three sources of origin:

- The natural gamma radiation emitted by the formations.
- Induced gamma radiation resulting from neutron bombardment.
- Gamma rays emitted by the source and scattered by the formation.

It has been found that a neutron derived porosity correlation is best for shale-free formations. Under this condition the natural gamma ray radiation is quite low, and therefore, will be neglected in this work.

The induced gamma ray radiation

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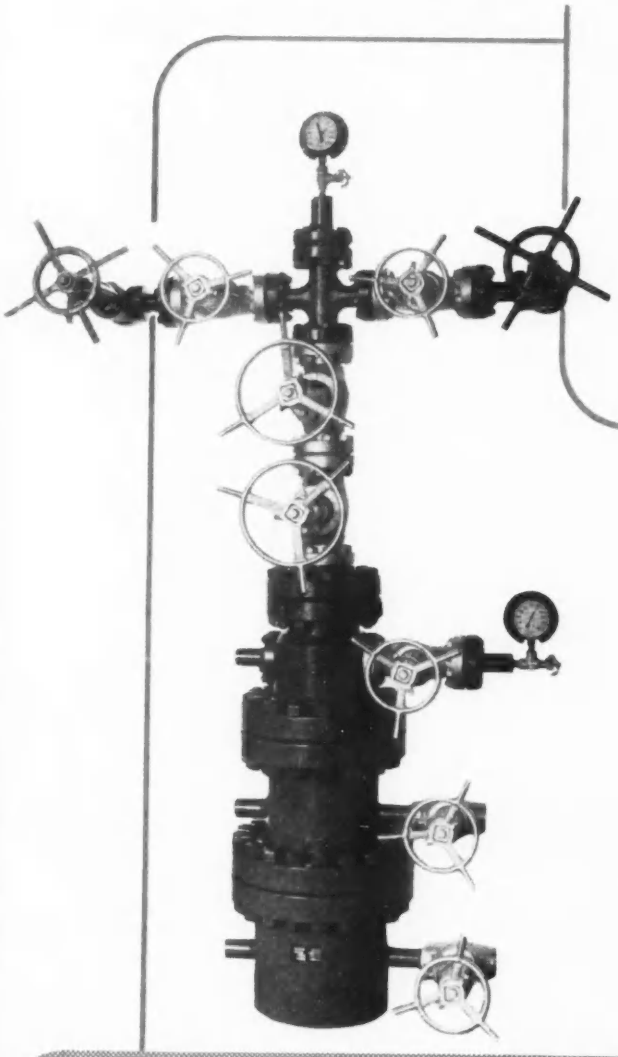

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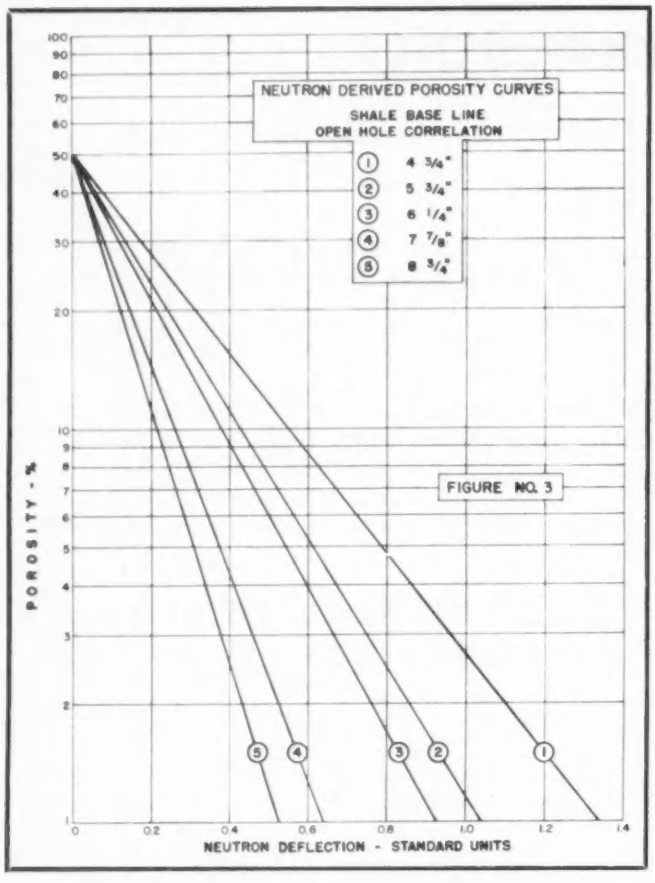
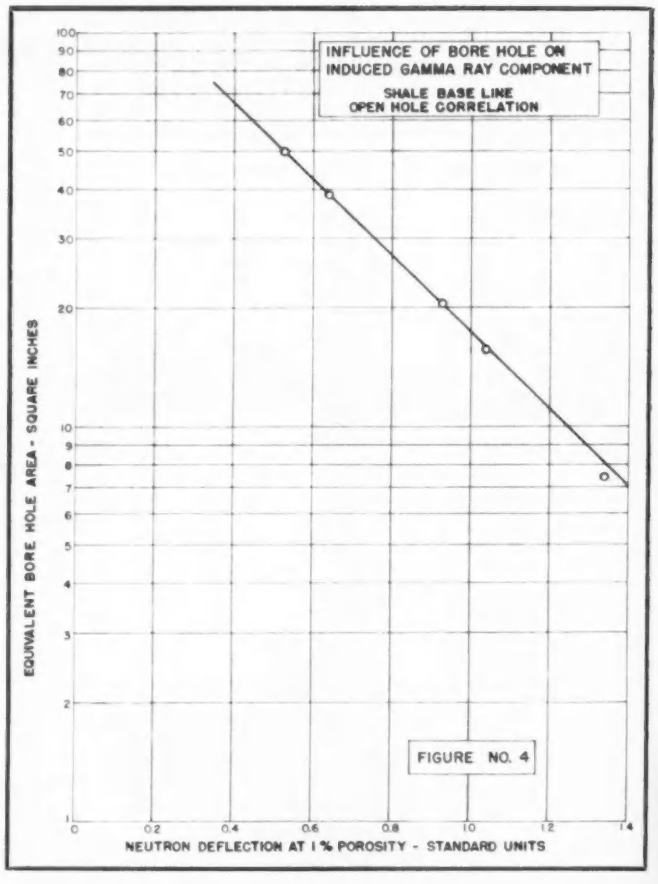


Correlation for various bore hole diameters in the Canyon Reef.


INFLUENCE OF BORE HOLE ON
INDUCED GAMMA RAY COMPONENT
SHALE BASE LINE
OPEN HOLE CORRELATION
FIGURE NO. 4
EQUIVALENT BORE HOLE AREA - SQUARE INCHES
NEUTRON DEFLECTION AT 1% POROSITY - STANDARD UNITS

Influence of bore hole diameter on induced gamma ray component. Neutron deflection obtained from Figure 3 at 1 percent porosity.

resulting from neutron bombardment is predominantly a function of the hydrogen atom concentration of the substance penetrated. Due to the geometry of the presently used system, the neutron-gamma curve indicates low radioactivity opposite high hydrogen concentration and high radioactivity opposite low hydrogen concentration (Figures 1 and 2).

Having a curve which measures hydrogen atom concentration, it follows that if the matrix of the formation penetrated consists only of atoms other than hydrogen, and if the fluid filling the pores is either oil or water, the curve should be an idication of porosity (both oil and water have practically the same number of hydrogen atoms per unit volume). The above criteria for a porosity correlation are fulfilled in clean sandstones and limestones in which the pore volume is completely filled with liquids (oil or water), but not in formations containing either free gas or shale or both.

Free gas, even under pressure, contains considerably less hydrogen per unit volume than oil and water; therefore, a variation in response on the curve would be expected, Campbell and Winter,[4] indicate that this difference in hydrogen concentration is sufficient to distinguish between sands containing water or oil and those containing dry gas.

Shale is a mineral that contains hydrogen in its molecular structure in addition to the hydrogen which is present in the water of hydration. Thus, in formations containing variable amounts of shale, the hydrogen concentration indicated by the curve is not a direct indication of porosity. Bush and Mardock[1] have indicated that a correction may be made by use of the gamma ray curve to provide a porosity correlation.

Since the induced gamma rays are predominantly a function of hydrogen concentration, it would be anticipated that the fluid filled bore hole would materially influence the logs. It has been pointed out that the neutron-gamma curve response decreases with increase in hydrogen concentration, therefore, the response due to the induced gamma ray component decreases with increase in fluid filled bore hole diameter.

The scattered gamma ray component of the log increases with increase in bore hole diameter. Although there is an influence due to the density of the formation, with the present commercially available instrumentation the scattered gamma ray component is essentially constant for a given bore hole diameter. This means that the scattered gamma ray component causes a shift of a fixed amount on the neutron-gamma log response for various bore hole diameters.

Porosity Correlation. It has been shown that the neutron-gamma log responds logarithmically to liquid filled porosity.[1, 2, 3] Such a correlation is established empirically by

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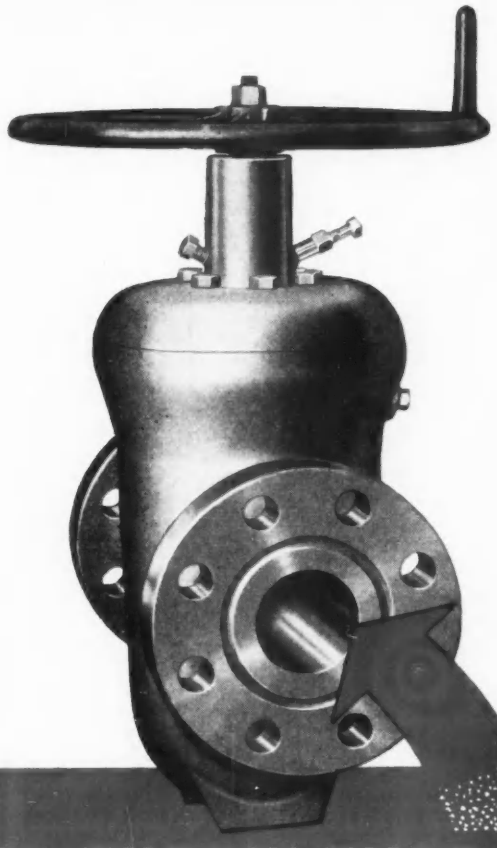

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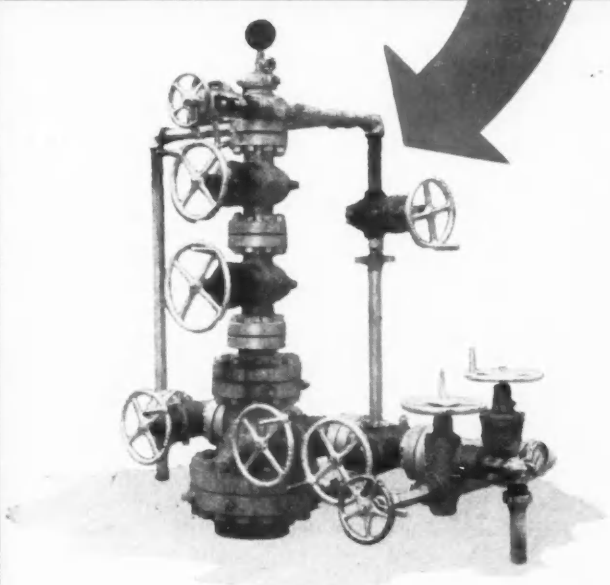

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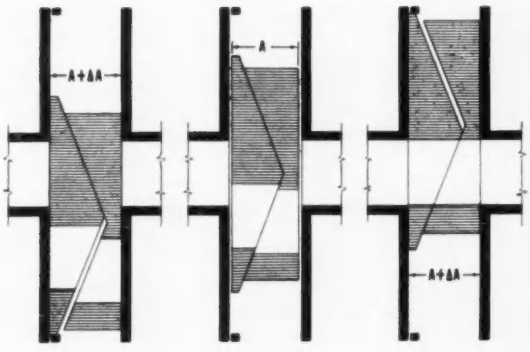

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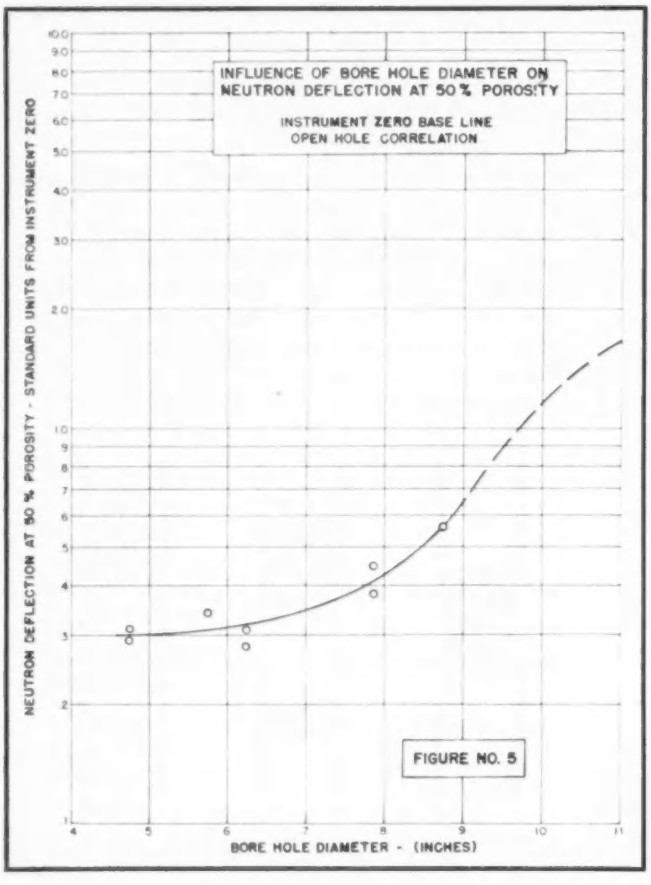
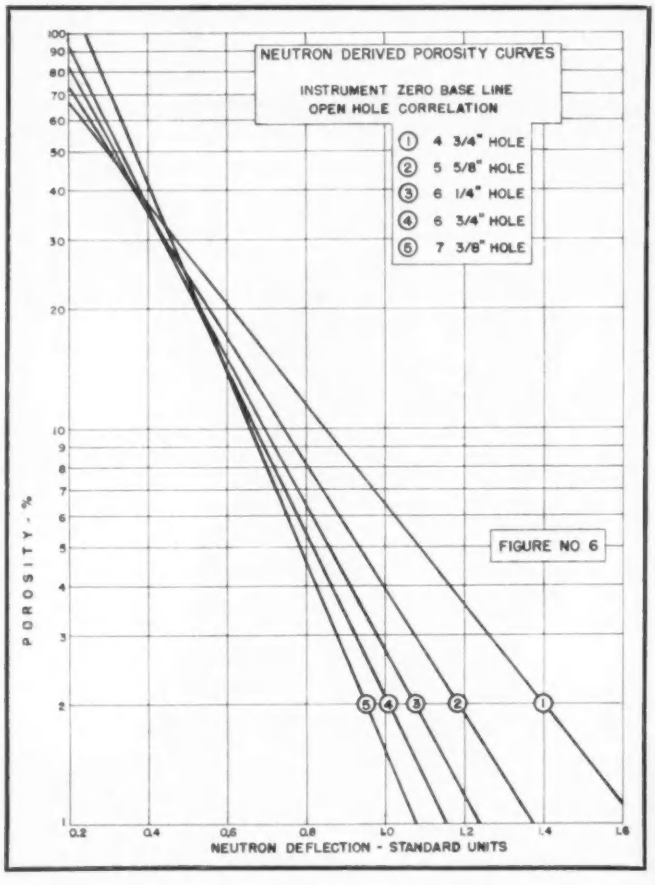

INFLUENCE OF BORE HOLE DIAMETER ON
NEUTRON DEFLECTION AT 50 % POROSITY
INSTRUMENT ZERO BASE LINE
OPEN HOLE CORRELATION
NEUTRON DEFLECTION AT 50 % POROSITY - STANDARD UNITS FROM INSTRUMENT ZERO
BORE HOLE DIAMETER - (INCHES)
FIGURE NO. 5

Neutron-gamma curve deflections from instrument zero to shale base line (50 percent equivalent porosity) vs. bore hole diameter.



Open hole porosity correlation for more common bore hole sizes as calculated from Figures 4 and 5.

plotting the neutron-gamma deflection from a convenient base line (instrument zero or shale base) as the abscissa and the porosity as the ordinate on semi-log graph paper and drawing a straight line through the points. An example of such a correlation is shown in Figure 1.

Figure 2 is a reproduction of a neutron-gamma log from the Canyon Reef of West Texas and the corresponding core analysis from which the above correlation was developed. It will be noted from Figure 1 that the neutron-gamma deflection is plotted in "standard units." The "standard unit" represents the neutron-gamma curve deflection from the base line of correlation measured in inches divided by the sensitivity of the log. This nomenclature supplies a quantity which is applicable to any log irrespective of sensitivity. Such a correlation may be established using any convenient base line; instrument zero or shale base line.

However, it should be pointed out that the use of instrument zero would provide a correlation which is applicable in any area; whereas the application of the shale reference correlation is limited to an area in which it can be ascertained that the hydrogen content of the shale is constant.

Empirical porosity correlations such as that shown in Figure 1 have been developed for five bore hole diameters. These open hole correlations were developed from core analysis data obtained in the Canyon Reef of West Texas. An analysis of these correlations has provided a basis for the development of relationships necessary to predict the neutron derived porosity correlation for various bore hole diameters.

Influence of Bore Hole. In order to determine the influence of bore hole diameter on the neutron-gamma porosity correlation, the factors controlling the slope and intercept of the curves must be analyzed. The induced gamma ray component of the log determines the slope of the curve, whereas the intercept is dependent upon both the induced and scattered gamma ray components.

The variation in intercept with hole size may be removed by selecting a base line on the log. In the past it has been found convenient to use the shale as a reference. However, it was not possible in every case to establish a shale base line; therefore, the equivalent porosity of the shale of 50 percent was selected as the base line (see Figure 1).

Such a correlation is readily developed by transposing the proper slope of the porosity correlations developed wherein the curve intersects 50 percent porosity at zero deflection. In essence, this produces a neutron derived porosity correlation with a shale base line. This correlation for the various bore hole diameters in the Canyon Reef is shown in Figure 3.

Having developed a series of porosity correlations with a common intercept, it is now possible to relate the influence of bore hole diameter to the slope of curve. Since it has been shown that the neutron-gamma log responds logarithmically to liquid filled porosity, it may be anticipated that the volume of the fluid in the bore hole may influence the induced gamma ray component of the log in a like manner.

This may be shown by a plot of the equivalent bore hole area *vs* neutron deflection from the shale base line for any given value of porosity. Figure 4 represents such a plot on semi-log graph paper wherein the neutron deflection was obtained from Figure 3 at one percent porosity. The equivalent bore hole area is the area

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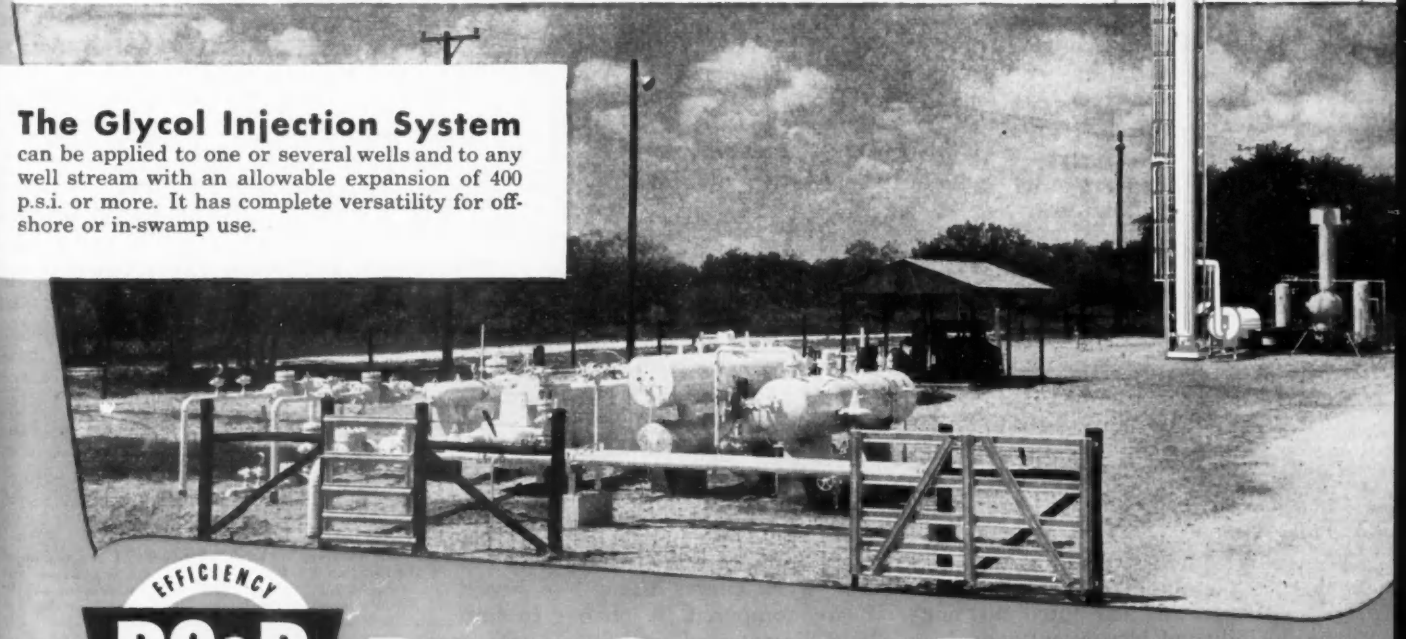

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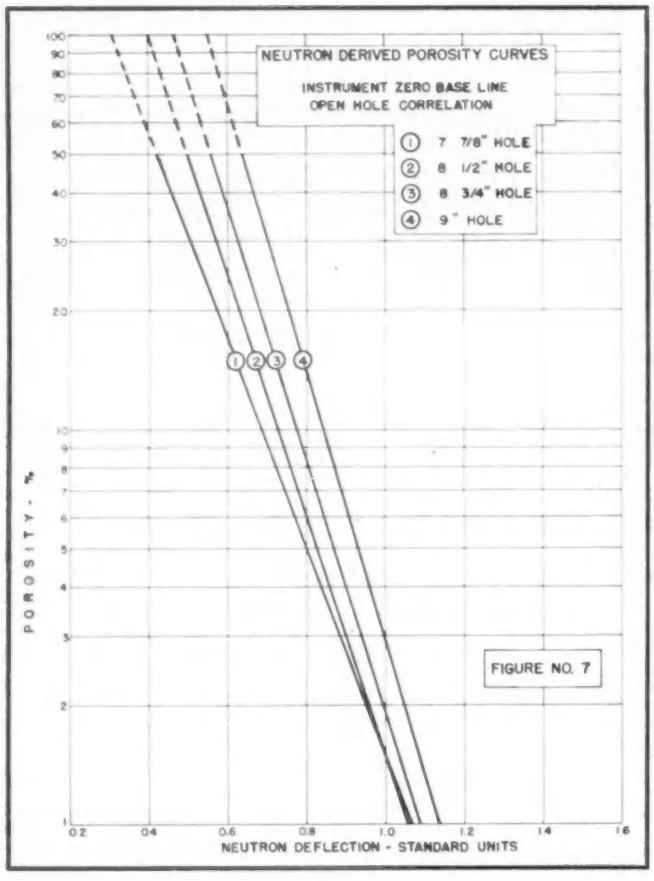
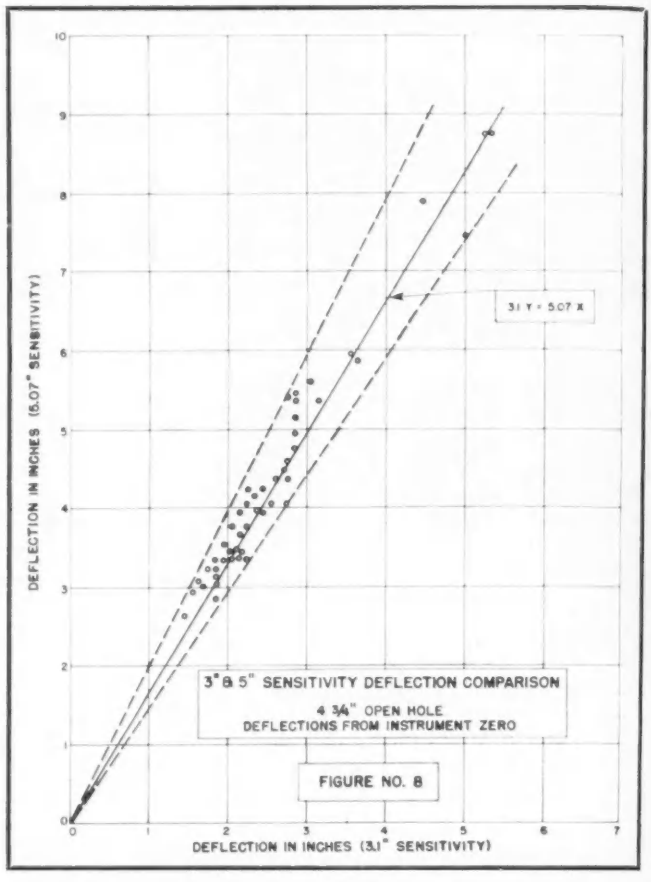


Open hole porosity correlations for more common bore hole sizes as calculated from Figures 4 and 5.


DEFLECTION IN INCHES (5.07" SENSITIVITY)
3.1 Y = 5.07 X
3" & 5" SENSITIVITY DEFLECTION COMPARISON
4 3/4" OPEN HOLE
DEFLECTIONS FROM INSTRUMENT ZERO
FIGURE NO. 8
DEFLECTION IN INCHES (3.1" SENSITIVITY)

Cross plot of neutron-gamma deflections of two logs obtained in same hole at two different sensitivities.

of the bore hole minus the area of the logging sonde (3⅝-inch diameter).

The variation in intercept with hole size may be readily demonstrated by a plot of neutron-gamma deflection from instrument zero for a fixed porosity *vs* bore hole diameter. Figure 5 is a plot of the neutron-gamma curve deflection from instrument zero to the shale base line (50 percent equivalent porosity) *vs* bore hole diameter. As stated previously the intercept is dependent upon both the induced and scattered gamma ray components. Whereas the two components cannot be separated with the data available, it may be stated that the induced gamma ray component is the predominant factor in small holes; that is, six inches or less.

The scattered gamma ray component becomes predominant in larger sized holes. The dotted portion of the curve indicates the anticipated trend of the scattered gamma ray component with further increase in bore hole diameter.

It will be noted from Figure 5 that there is considerable scatter of data. This scatter is attributed to nonproducibility of instrument zero since the two data points for 7⅞-inch hole were obtained from repeat runs in the same hole.

Calculated Porosity. Having established the influence of bore hole diameter on the induced gamma ray and scattered gamma ray components, it is now possible to calculate liquid filled neutron-gamma porosity correlations for shale-free formations. Figures 6 and 7 show open hole porosity correlations for the more common bore hole sizes as calculated from Figures 4 and 5.

An examination of these curves reveals several critical factors which influence the quantitative interpretation of neutron-gamma logs. The sensitivity of the neutron-gamma curve to changes in porosity decreases with increase in bore hole diameter. This requires an accurate determination of instrument zero if reasonable estimates of porosity are to be obtained in large holes.

Of even more importance is the large influence of small changes in bore hole diameter on the log when run in large holes. This becomes evident when curves 3 and 4 of Figure 7 are compared. A change in bore hole diameter of one quarter of an inch (8¾ to 9 inches) corresponds to a large change in the neutron derived porosity. The scattered gamma ray component is primarily responsible for this shift.

Statistical Error. In order to determine the reproducibility of the log and the magnitude of statistical error, repeat logs were obtained in the same hole at two different sensitivities. Figure 8 is a cross plot of the neutron-gamma deflections of the two logs.

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[2] Scotty, C. B.: "Quantitative Log Interpretation of the San Andres Dolomite," World Oil, (1951) 133, (1), 166.

[3] Bush, R. E., and Mardock, E. S.: "The Quantitative Application of Radioactivity Logs," *Trans.* AIME, (1951) 192, 191.

[4] Campbell, J. L. P., and Winter, A. B.: "Dry Gas Sand," *Tomorrow's Tools Today*, Lane-Wells Co., (1947).

ACKNOWLEDGMENT

The authors acknowledge helpful discussion of the subject by G. Herzog, K. C. ten Brink and A. S. McKay. They thank the management of The Texas Company Producing Department for the permission to publish this paper.

This paper was presented at the AIME Petroleum Branch Fall Meeting held in Houston, Oct. 1-3, 1952.

FIGURE 1.
Plunger and piston of shop-made sand pump shown across the top end of the pump barrel.

next smaller size of casing. An ellipse shape was cut from the bottom edge of the pump barrel, and the flapper hinged at the apex of the cut. The opposite side of the barrel was "doubled walled" by welding a small piece of metal to the inside casing wall. This double thickness provided sufficient metal in which threads could be cut. A half-inch allen-type screw was inserted in the tapped hole so nothing protruded on the outside of the pump barrel. When the screw extended slightly inside the barrel, the flapper was prevented from swinging outward.

Top of the pump barrel contained a square shoulder formed by welding the box end of a 2⅞-inch drill pipe to a flanged plate attached to the barrel. A short stub of the drill pipe extended from the barrel so the pump could be fished from hole with ordinary fishing tools should the pump become sanded up or stuck.

Plunger of the pump was made from two-inch bar stock which was recessed at one end that connected to

■ CONTINUED ON PAGE 184

Shop-Made Pump Aids Operators

Here's how oil field ingenuity combined an old bailing principle with bits of scrap metal and a joint of salvaged casing.

AN OLD-TIME bailing principle was incorporated along with bits of scrap metal and a salvaged section of casing to make up a satisfactory sand pump or bailer. Principal elements are the pump barrel, a foot valve, and a sliding piston operated by the sand line. The barrel was made from a joint of 5½-inch casing, measuring about 28 feet in length. Size desired may be increased or decreased as required by using other standard sizes of casing.

A simple foot valve, hinged to the bottom of the pump barrel (Figure 2) was constructed so that it would make a full swing in both directions. When going in the hole, the valve would swing up inside the casing to minimize restrictions that might impede the fall of the pump through fluid. When dumping the sand pump, a pin was removed so that the valve would swing fully outward to empty quickly the pump contents.

This flapper type foot valve was made from a coupon cut from the

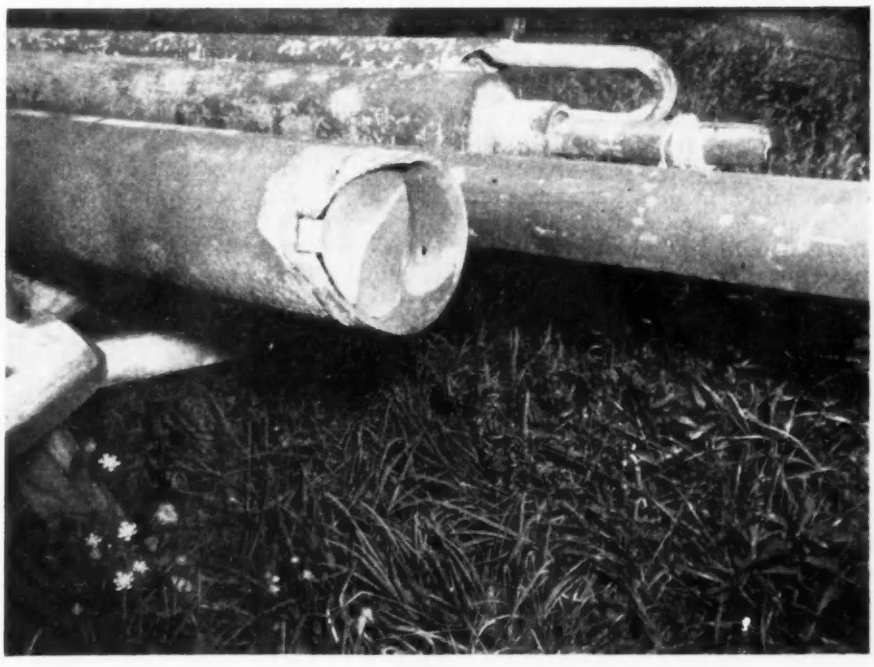

FIGURE 2.
Bottom end of sand pump showing construction of foot valve.

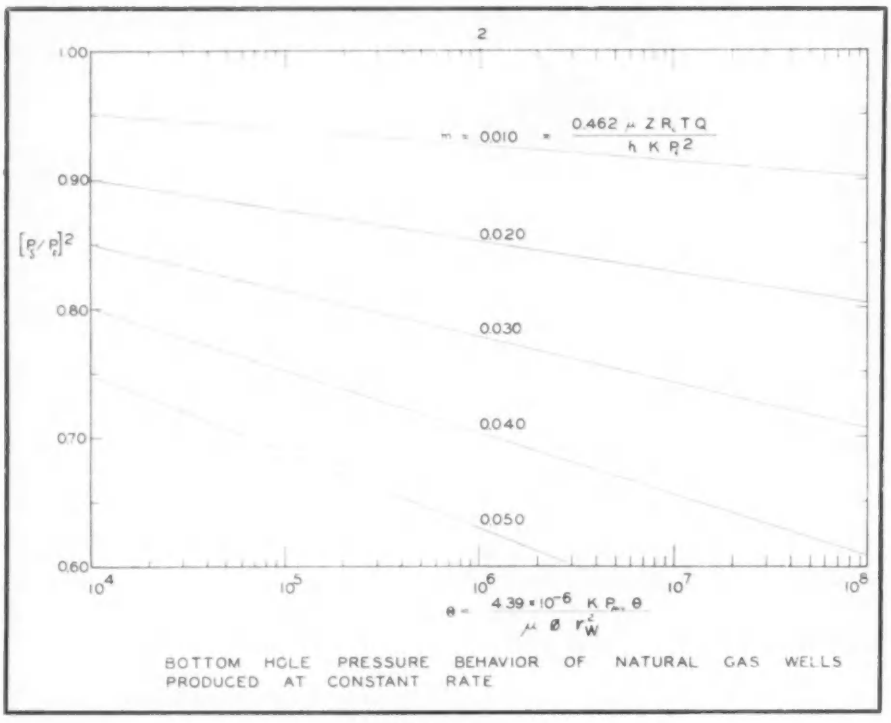

FIGURE 1.

New Method Estimates Gas Well Performance

Expected deliverability can be determined by simple extrapolation of back-pressure tests thereby saving extensive testing.

By DR. DAVID CORNELL
Texas Petroleum Research Committee, Austin

DAYS CAN BE saved in gas well testing to determine its performance by a new, simple method that needs only short tests that are extrapolated. Estimation of the ability of a gas well to deliver predetermined quantities of gas at certain pressures over a definite period of time is normally accomplished by means of an empirical back-pressure curve. To be carried out properly, the complete back-pressure test in some cases might require several days. Consequently, any means by which short tests may be made and then extrapolated will be of importance in making such calculations, resulting in savings to the operator.

One of the most important tools in natural gas reservoir analysis at the present time is the back-pressure curve. This standardized procedure for testing gas wells provides the necessary information for the estimation of gas deliverability rates. For low permeability reservoirs, however, the back-pressure test may require considerable time to make. The time may be shortened by making comparatively short flow tests and extrapolating the test data to longer periods of time. For example, a well might be tested at each flow rate for only four hours and the resulting pressure draw-down curve then might be extrapolated to a 24 hour bottom-hole pressure.

Extrapolation of bottom-hole pressures is facilitated by the use of reservoir pressure gradient curves previously presented.[2] A plot of the dimensionless variables $(p_s/p_f)^2$ versus the logarithm of H with the dimensionless term, m, as a parameter may be made for the point in the reservoir at the well bore where $R = r/r_w = 1.0$. Figure 1 is such a plot and shows at a constant flow rate (or a constant value of m) that, after the initial period of adjustment, draw-down data should be represented by a straight line. For any value of m, then, bottom-hole draw down pressure data may be extrapolated readily by use of a plot of $(p_s/p_f)^2$ versus the logarithm of time.

In actual practice, the flow rate will not be quite constant because critical flow provers, which are rounded orifices operating at pressure ratios greater than about 1.75/1.00, are used to control the flow rate of gas from the well. A critical flow prover has a constant throat velocity at a Mach number of unity, but since the density of the gas varies with the upstream pressure, the weight of gas flowing varies with the upstream pressure. The equation for the critical flow prover is given by Brown, et al[1] and one form appears here as Equation 1.

$$W = A\ p_o \sqrt{\frac{(g_c)\ (k)\ (M)}{(R_c)\ (T)} \left(\frac{2}{k+1}\right)^{\frac{k+1}{k-1}}} \qquad (1)$$

In Equation 1, W is the mass rate of flow and p_o is the pressure upstream from the critical flow prover. It can be seen that the flow rate is directly proportional to the upstream pressure. Hence, any back-pressure data taken over a wide pressure range using a critical flow prover must be corrected for the varying flow rate in order to extrapolate the draw-down curve correctly.

The values of $(p/p_f)^2$ may be corrected to the flow rate at a particular time. This flow rate at the end of the draw-down period is usually recorded, so that flow rate will be used here. The equation for correcting $(p/p_f)^2$ is taken from earlier work[2] and is given here in the form for use in this particular application as Equation 2.

$$\left(\frac{p}{p_f}\right)^2_{\text{corrected}} = 1.00 - \left[1.00 - \left(\frac{p_s}{p_f}\right)^2_{\text{observed}}\right]\left[\frac{p_s}{p_{base}}\right] \qquad (2)$$

The pressure p_{base} is the last pressure measured during the test and p_s is the pressure measured at any time during the test.

Table 1 shows data taken from the work of Haymaker, Binckley and Burgess[3] for the pressure decline of a natural gas well being produced through a critical flow prover. In this case, however, there is a change of only 3 percent in the pressure so that

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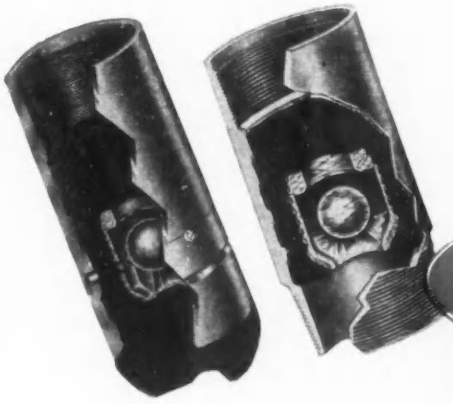

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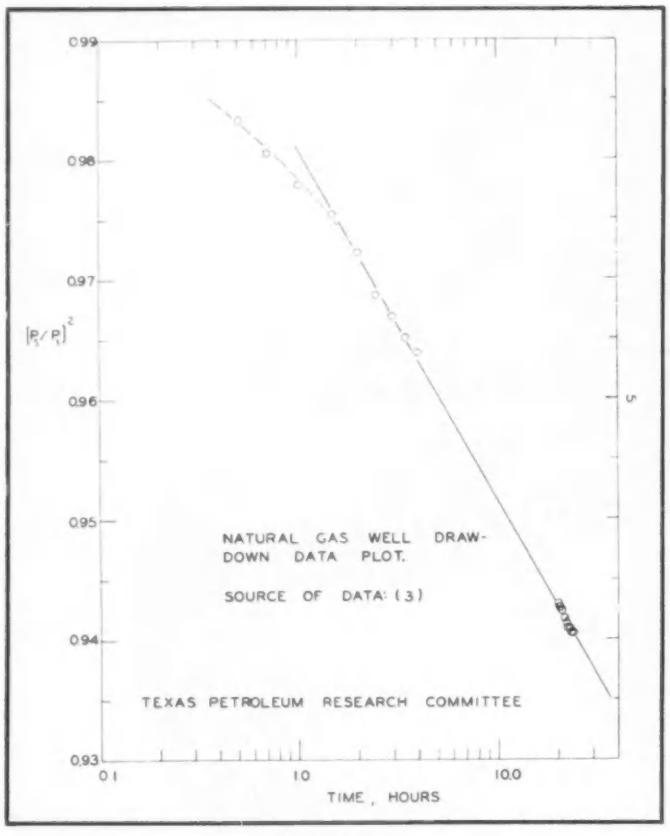

FIGURE 2.

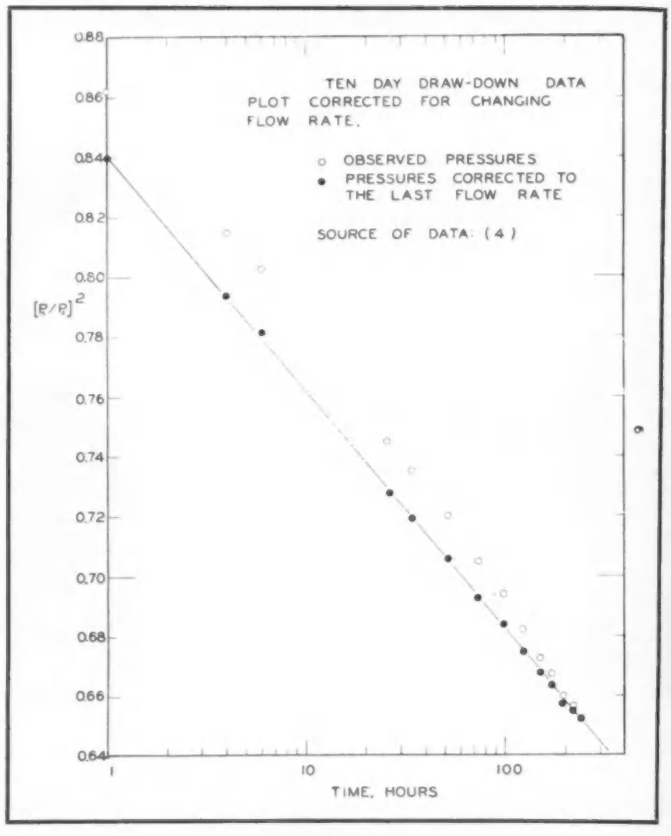

FIGURE 3.

no correction is actually needed for the change in flow rate which would also be only about 3 percent.

Figure 2 is a straight line plot of $(p_s/p_f)^2$ versus the logarithm of the time for the data of Table 1. As might be expected, there is a certain amount of deviation in the initial part of the curve due to the greater unsteady state effects during the first few minutes of production.

Figure 3 gives an example from data presented by Katz[4] in which the change in flow rate amounts to about ten percent and cannot be neglected. Accordingly, the data were corrected as in Table 2 and replotted as the straight line on Figure 3. These results are not strictly quan-

TABLE 1
Pressure Decline Data for a Natural Gas Well[3]

Time, Hours	Bottom Hole Pressure, psia.	$(p_s/p_f)^2$
0.0	450.0	1.0000
0.5	446.2	.9833
0.7	445.6	.9805
1.0	445.0	.9779
1.5	444.4	.9754
2.0	443.7	.9722
2.5	442.9	.9686
3.0	442.5	.9669
3.5	442.1	.9651
4.0	441.8	.9639
20.0	437.0	.9430
20.5	436.9	.9426
21.0	436.8	.9423
21.5	436.7	.9417
22.0	436.6	.9413
22.5	436.5	.9409
23.0	436.5	.9409
23.5	436.4	.9405
24.0	436.4	.9405

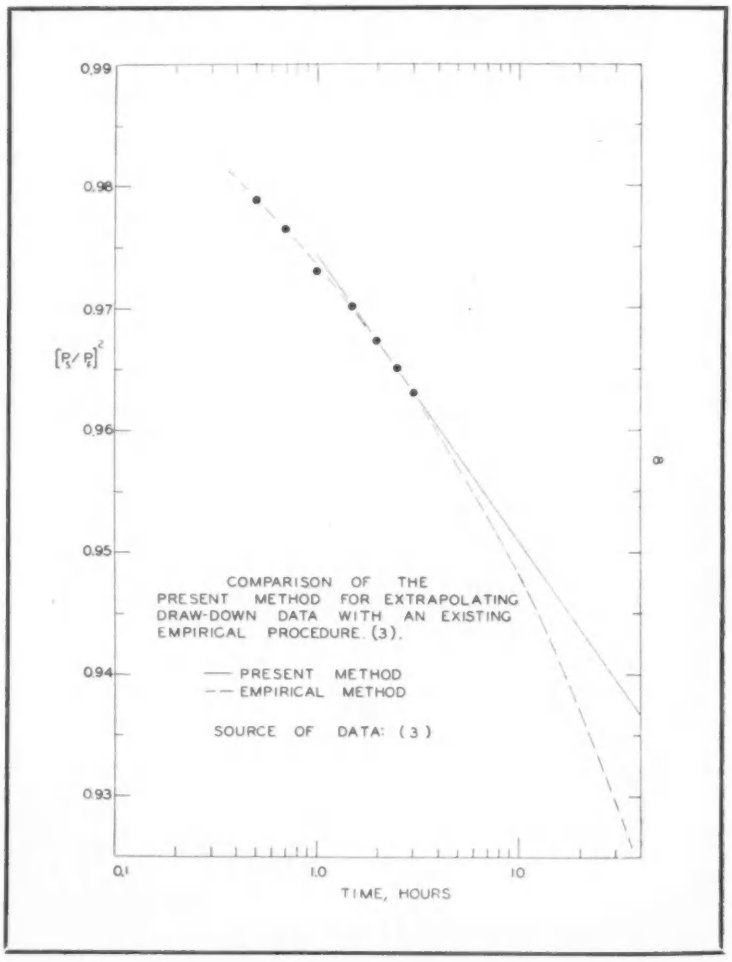

FIGURE 4.

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titative because they deal with the well-head rather than the bottom-hole pressures, but do show the validity of the extrapolation procedure over long periods of time.

Haymaker, Binckley, and Burgess[3] have presented an extrapolation method based on Equation 3.

$$\log \Theta = c \log (p_r - p_s + b) + \log a \quad (3)$$

The constants a, b, and c in Equation 3 are empirical constants and the value of b is chosen to cause Equation 3 to represent the data as a straight line. This empirical method is compared with the present exrapolation procedure in Figure 4 using another set of test data. Haymaker, Binckley and Burgess[3] presented the data for the three-hour test shown in Figure 4. It is to be noted that the empirical procedure uses all of the flow data, while the straight line of Figure 4 is based on only the data points taken after an hour of flow.

During about the first hour of production, greater unsteady state effects occur, so only the points after about one hour are expected to follow a straight line on Figure 4. The empirical procedure gives equal importance to these first points. By the empirical procedure the bottom-hole pressure is 411.0 pounds per square inch absolute at the end of 24 hours. By the present method, this bottom-hole pressure is 413.0 psia at the end of 24 hours.

Actual pressure at the end of 24 hours was not reported. At longer times a much greater deviation would occur. When longer periods of time, such as those of Figure 3, are considered, the present method is preferable for extrapolation purposes. In fact, for the 242.5 hour test given in Table 2, a straight line cannot be obtained by the empirical procedure except by using unusually large values of the constant, b.

Conclusions. A simple extrapolation procedure based on theoretical considerations has been presented for correlating and extrapolating bottom-hole pressure decline data for natural gas wells producing at a constant rate. For data taken using a critical flow prover for which the rate will not be constant but will vary with the upstream pressure, a method of correcting the data has been given. The proposed extrapolation procedure has been compard with an available empirical method. The empirical method gives bottom-hole pressures that are lower than the present method, with larger deviations at greater extrapolations.

ACKNOWLEDGMENT

This work was supported by the Texas Petroleum Research Committee at the University of Texas, Austin.

NOMENCLATURE

a, b, c — constants
A — area, ft²
g_c — 4.17×10^8 (lb mass)(ft)/(lb force)(hour²)
h — formation thickness, feet
k — ratio of heat capacities, c_p/c_v, for a gas
K — permeability, millidarcies
m — $\frac{0.462\ \mu\ z\ R\ T\ Q}{h\ k\ p_r^2}$
M — molecular weight
p — pressure, psia
p_{avg} — average pressure, psia
p_{base} — last bottom-hole pressure obtained during a flow test, psia
p_r — formation shut-in pressure, psia
p_s — bottom-hole pressure, psia
$p_{s.i.}$ — shut-in well head pressure, psia
$p_{w.h.}$ — well head pressure, psia
Q — rate of production, MCF/D
r_w — radius of the well bore, feet
R — 1545 (lb force)(ft)/(lb mole)(° Rankine)
T — temperature, degrees Rankine
W — weight rate of flow, lb/hr
z — compressibility factor
Θ — time, minutes
H — $\frac{(4.39 \times 10^{-6})\ K\ p_{avg}\ \Theta}{\mu\ \phi\ r_w^2}$
μ — viscosity, centipoise
ϕ — fractional porosity

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[1] Brown, G. G., et. al., *Unit Operation*, John Wiley & Sons, Inc., New York (1950).

[2] Cornell, David. "How To Determine Gas Well Interference Graphically," WORLD OIL, Nov., 1952, pg. 187.

[3] Haymaker, E. R., Binckley, C. E., and Burgess, F. T. "Method of Establishing a Stabilized Back Pressure Curve for Gas Wells Producing from Reservoir of Extremely Low Permeability," *J. Petroleum Technol.* 1, 71 (1949).

[4] Katz, D. L. "Draw-Down of Well Head Flowing Pressures on the Nusbaum and Stookey Wells," Federal Power Commission Docket C-1302, Exhibit 82 (March 14, 1950).

TABLE 2

Pressure Decline Data for Stookey No. 1 Natural Gas Well[4]

TIME HOURS	Well Head Pressure, psia.	$(p_{w.h.}/p_{w.i.})^2$	$1.00 - \left[1.00 - \left(\frac{p_{w.h.}}{p_{w.i.}}\right)^2\right]\left[\frac{p_{w.h.}}{441.7}\right]$
0.0	441.7	1.0000	1.0000
1.0	410.0	.8616	.8409
4.0	398.7	.8144	.7926
6.0	395.7	.8024	.7808
26.5	381.2	.7448	.7273
34.0	378.7	.7351	.7188
51.5	374.7	.7196	.7055
73.0	370.7	.7042	.6926
99.0	367.7	.6930	.6835
124.5	364.7	.6818	.6747
150.0	362.2	.6724	.6674
171.0	360.7	.6668	.6631
195.0	358.7	.6593	.6575
221.0	357.7	.6558	.6549
242.5	356.7	.6522	.6522

Shop-Made Pump

■ CONTINUED FROM PAGE 179

the sand line or bailing cable. A heavy steel ring was welded around the middle of this rod to contact the top of the bailer so it could be pulled from the hole. It also served as a jarring device in the event the pump became stuck in the hole. By reciprocating the sand line attached to the plunger, the pump could be "bumped" repeatedly in jarring it from the hole.

The lower end of the plunger was cut down from two inches to one inch in diameter. The piston assembly was cut from a heavy piece of belting material that fitted snugly inside the pump barrel and around the plunger. At the shoulder created by the change in plunger diameter, a steel prong was welded so that it formed about a 45-degree angle with the axis of the rod.

Purpose of this prong was to push the piston sidewise when the plunger was lowered to allow fluids to pass through the pump as it was lowered into the well. A reinforcing washer made from $\frac{3}{8}$-inch plate steel was placed immediately below the fiber piston. It fit loosely on the plunger so it, too, could be pushed at an angle to pass fluid through the pump. A square shoulder nut was screwed on the bottom of the plunger to support the metal washer and piston on the upstroke.

In operation, the sand pump was lowered in the hole on the sand line. On the descent, the pump barrel hung from the metal ring welded to the plunger. The foot valve was supported by the extended allen screw so that it rested in somewhat of a horizontal position, but would swing inward to allow fluids to pass through the pump barrel. When the pump struck bottom, the sand line was paid out so that the piston would fall to the bottom of the pump, striking the foot valve.

When the sand line was taken up suddenly, the piston would flatten out against the metal washer and the suction created would draw in sand and fluids. The procedure could be repeated until the pump was fully loaded. By reeling in the sand line, the pump was raised to the surface.

To dump the sand pump, the allen screw holding the foot valve closed had to be loosened so that the flapper could swing outwardly. Since the piston was in the top part of the pump barrel, the pump contents could dump freely from the barrel. The flapper was then positioned up inside the barrel, the allen screw again extended inside the wall to support the valve, and the tool lowered to bottom for another load.

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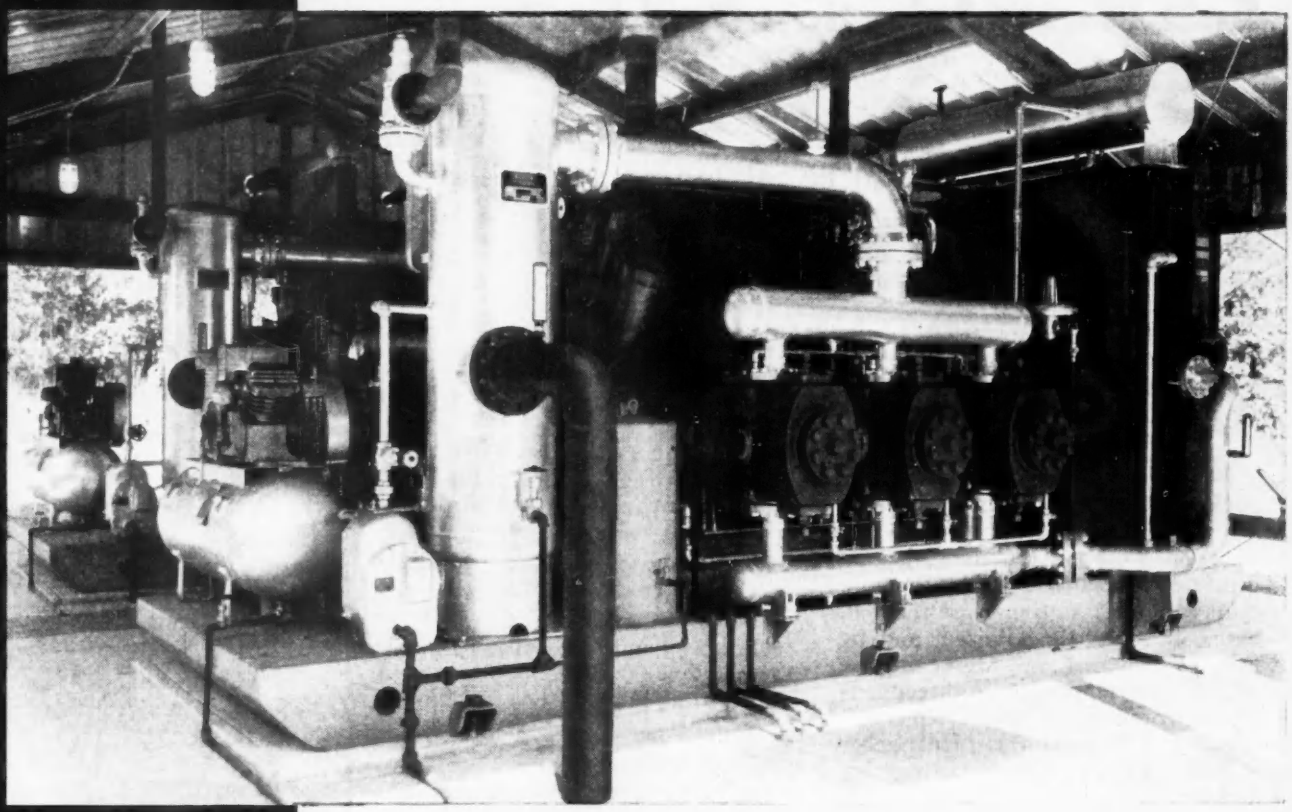

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Inverted-Type Packer Solves Salt Water Injection Problem

Corrosion can be minimized and a positive casing-to-tubing pack-off obtained.

By GEORGE S. FLANDERS
Lane-Wells Company, Los Angeles

INVERTED OR UPSIDE-DOWN type packers offer a ready solution to many problems encountered in salt water injection wells where the injection pressure is relatively high. Pressure differentials serve to increase the seal, corrosion can be minimized, and by using a tail pipe, salt water can be prevented from coming in direct contact with the packer seat. Help is offered when running this type packer in casing strings of different weights and, therefore, different internal diameters.

This type packer is finding application in salt water injection projects where special conditions prevail. Although this tool is an adaptation of the conventional packer, some operators are not too familiar with its functions. Primarily the upside-down packer is used to obtain a positive casing-to-tubing pack-off in any average-duty application where lack of tubing weight or extremely high bottom-hole pressures make it impractical to use a conventional packer. It is being used in shallow wells, water flood operations and in the various methods of formation fracturing. However, the technique of running, setting and recovery differs radically from that employed in other packer operations.

Recently, problems encountered in a salt water injection project in South America pointed out some helpful applications of inverted packers for this type operation. Problems of this project are not too different from those found anywhere, and a brief discussion of them should point to improved completions for salt water injection wells. Basic conditions involved in the operation were:

- Mixed casing strings in the wells —6⅝-inch 20-pound and 24-pound.
- The operator assumed the tubing size to be 2⅞-inch outside diameter.
- Setting depth of packer approximately 3000 feet.
- Injection pressure at surface 1500 pounds per square inch.
- Type of fluid to be injected was salt water, presumably sea-water having a pressure factor of approximately 0.5 psi per foot of column.

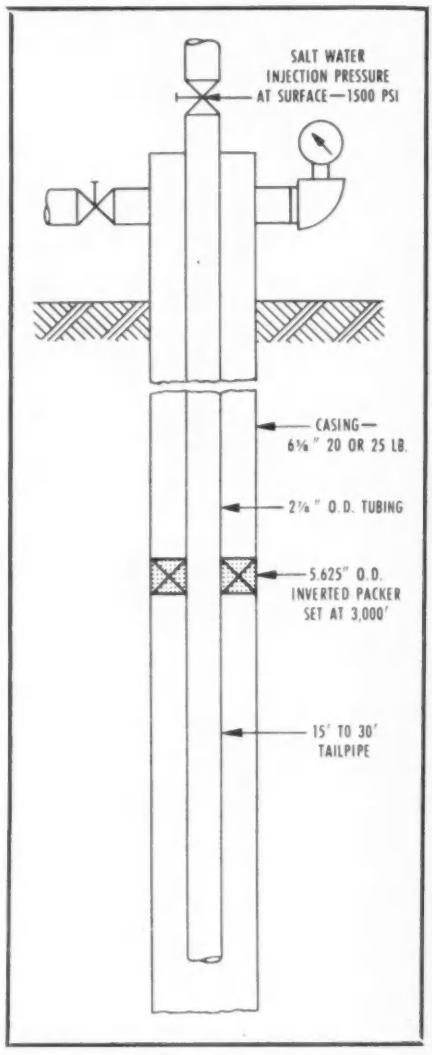
Whether tubing was 2⅜, 2⅞ or 3½ inches, makes relatively little difference since in any case the down-hole differential force will be found so high as to preclude the use of any casing packer set in the usual manner.

Under the foregoing conditions the effective upward force at the packer (using 2⅞-inch tubing in the calculations) is approximately 72,000 pounds. In the event the packer is set with the tubing in full compression and the annulus above the packer loaded to the surface with oil of 0.85 specific gravity, the weight of the tubing, approximately 19,000 pounds, and the column of oil, approximately 24,000 pounds, will exert a downward force of about 43,000 pounds. This compared with the down-hole force under conditions during injection (72,000 pounds) leaves a differential in favor of the section below the packer of approximately 29,000 pounds. Any packer set in the conventional manner would be unseated and the "pack-off" destroyed.

Inverted packers are provided with essential features to assist in their recovery and utilize this differential force to accomplish a tighter "set." After being located at the desired setting point, the packer should be set with the tubing in tension. Any increase in force from below the packer will only serve to set the packer more securely and make the "pack-off" more snug. Under the stated conditions, as close a fit between packer outside diameter (unset) and casing inside diameter as is possible, consistent with safety in running and pulling the assembly, is indicated.

Mixed weight casing of similar diameter as indicated is a problem that is fairly common to all fields. In this particular case, the record was not definite as to which weight had been used in individual wells (also not uncommon, especially in old fields) and that therefore it was necessary to use a packer that would operate efficiently in both weights of casing.

In answering this problem, it was recommended that an inverted packer having a maximum O.D. of 5.625



Inverted-type packer installation in salt water injection project.

inches be used. This type, when run in 6⅝-inch, 20-pound casing, having a nominal I.D. of 6.049 inches affords a clearance, on the diameter, of 0.424 inch. The same packer run in 6⅝-inch 24-pound casing having a nomina I.D. of 5.921 inches would afford a clearance, on the diameter, of 0.296 inch. The clearances in both pipe weights are well within permissible limits and the packer recommended should perform efficiently for both casing weights.

Completion. Procedure would involve first running tubing and packer to desired depth, then circulating with oil until any water or mud fluid in the well was displaced and the hole filled with clean oil to the surface. After this the packer would be set and water injection started.

Based on the foregoing procedure, or any other which would leave clean oil below the packer before salt water injection was started, the operator was advised to run a tail pipe below the packer, 15 to 30 feet in length. This length would place the bottom of the tail pipe far enough into the oil column below the packer so that turbulence from the injection of water through the pipe would not extend upwards far enough to disturb the oil column immediately under the packer. This oil, having a lower specific gravity than the salt water, would then remain at the top of the fluid column below the packer, isolating the lower section of the packer from the salt water and protecting it from salt water corrosion. As further protection against corrosion it was recommended that the interior of the injection string be coated so as to prevent salt water contact with the metal.

Corrosion. Some operators specify packers made of special metals or alloys. One operator specified an expensive bronze packer without realizing that while his packer would have had a minimum of corrosion, the battery action set up between the bronze packer and the steel casing would have very quickly corroded the adjacent casing and probably destroyed it. Conversely, if the packer were zinc coated, even galvanized, the same electrolytic action would be set up between packer and casing and with this combination the packer coating would soon have been destroyed.

The best protection at present is to use packers made of metals of similar or nearly similar composition as the casing and thus corrosion from salt water will be less than where dissimilar metals are employed. This practice applies to all bore hole assemblies and not only to packers.

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How to Pump Deep Dual Completions Alternately

Raising and lowering rod string allows selectivity in pumping from the upper or lower zone.

By J. R. HATFIELD
Cities Service Oil Company,
Bartlesville, Okla.

ALTERNATING PUMPING of two zones through the same well casing from depths of 10,000 feet has been done successfully by the Cities Service Oil Company in West Texas and western Kansas. The key to such a mechanical problem in rod pumping where it formerly was a practice to manipulate the tubing, is a changeover device that permits selectivity of the zone to be pumped.

As early as 1940, a number of installations were made in western Kansas where a production packer was set in the casing between two productive zones. A footpiece was placed on the bottom of the tubing extending through the packer. The tubing footpiece contained perforations so that lowering the tubing would cause the perforations to move to a point below the packer permitting the lower zone to be produced. Raising the tubing three or four feet would raise the perforations above the packer shutting off the lower zone and permitting oil to enter the tubing from the upper zone. A packing material was used between packer and tubing such that when one zone was being produced the other zone would be shut off.

A changeover tool was built and first installed in a West Texas well in April, 1950. Some changes were subsequently made in the tool. Figures 1 and 2 show the design currently being used. The changeover device is approximately five feet in length. It consists of a spring positioning device Part A, recesses at points X and Y for positioning Part A, seating nipple C, packoff cups B, tubes D and E, holes G in the tube D, and slots F in tube E constitute the valve mechanism. Bottom lock holddown H seats in a conventional shoe. The packer can be placed just below the shoe or can be placed any distance below depending on conditions.

In Figure 1 the changeover tool is in position to pump from the upper zone, with Part A positioned at X. Oil enters the tubing through holes at K, travels around the annulus and enters tubes E and D at L and moves from this point up through the standing valve and insert pump.

Figure 2 shows the changeover device in position to pump from the lower zone with positioning device A at Y. It is necessary to bump the rod string to force part A out of recess X and down to recess Y. In position Y tube D has been lowered to the point where perforations G extend below tube E and the rod extension on tube D forces ball J away from its seat permitting oil to enter the bottom of the tubing and move up around tube D, through perforations at G and on vertically through the standing valve and insert pump. Any make of insert pump and standing valve can be used with the device.

With the present design it is necessary to use a pulling unit to change from one zone to the other. Thirty-foot polished rods are used which permits changing without removing the stuffing box.

Cities Service Oil Company has installed the tool in five wells in West Texas and one well in western Kansas. The device has given satisfactory operation. The general plan of operation is to pump one zone the last half of one month and the first half of the following month with the change over being made in mid-month. In this manner, only one change per month is needed to pump the well's allowable from each zone.

There is sufficient difference in the crude produced from the two zones to identify the zone being produced. A report is made each time the tool is changed, indicating the gravity and color of the crude, and by hydrogen sulfide content of the gas. Time required for the oil to reach the surface is also recorded. A valve at the well head is opened to direct the oil through a line to the proper tank battery. Blanking tools can be run to shut off either zone when it is desired to take bottom-hole pressures.

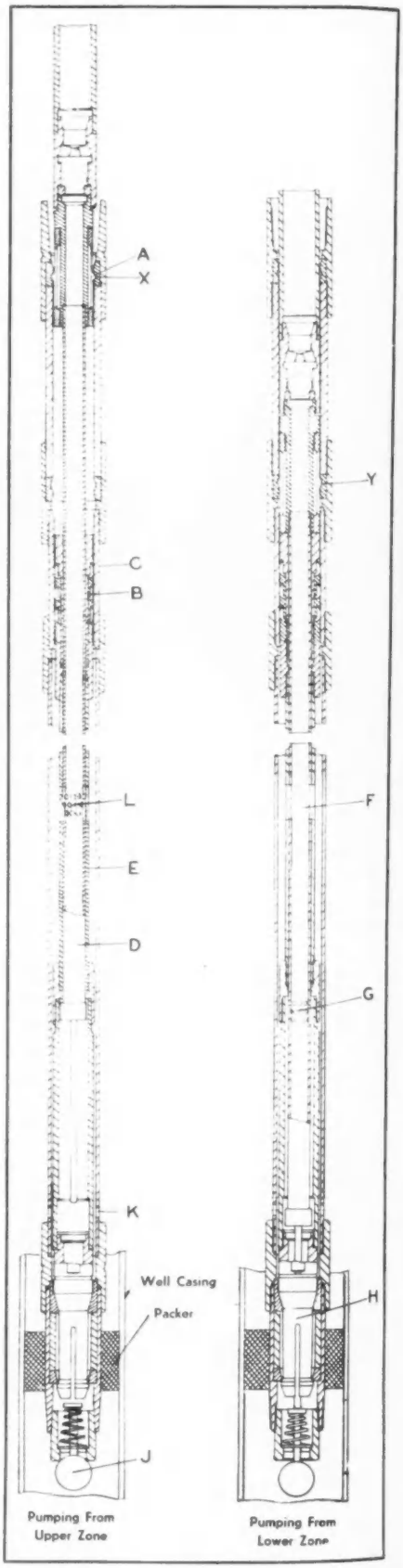
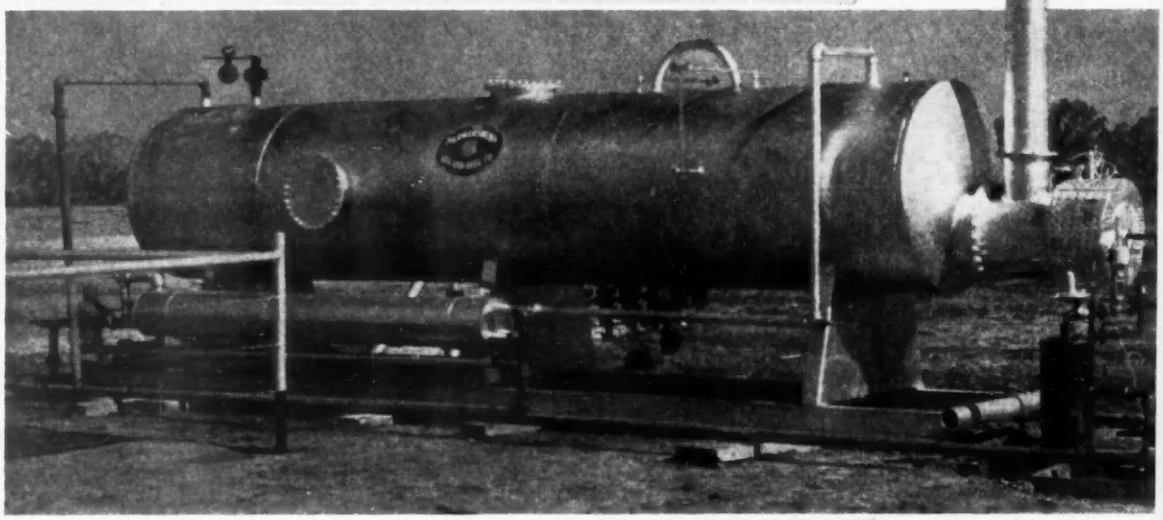


FIGURE 1. FIGURE 2.

Announcing...

PARKERSBURG'S NEW HORIZONTAL TREATER



Greater Efficiency Proved by Extensive Field Testing!

With usual Parkersburg thoroughness, this new horizontal treater has been subjected to long and exhaustive field testing to prove the efficiency of its numerous advancements in design and engineering.

The flume and pre-heater section is considerably larger than in other horizontal treaters. All possible gas is released when emulsion enters treater and spreads in thin layer of this large flume plate. The emulsion flows downward very slowly so that an exceptionally high rate of heat exchange is obtained.

Initially separated gas passes through an equalizer loop into upper portion of settling chamber. This design prevents gas from passing through emulsion as it flows toward outlet . . . turbulence is minimized.

For installations where indications show that extremely high volumes of gas may be encountered, an optional by-pass gas scrubber is offered.

Larger settling space provides more settling time and less disturbance to emulsion.

Complete assembly and skid mounting of the Horizontal Treater before shipping, plus ground level hook-up, frequently saves over $200.00 on installation costs.

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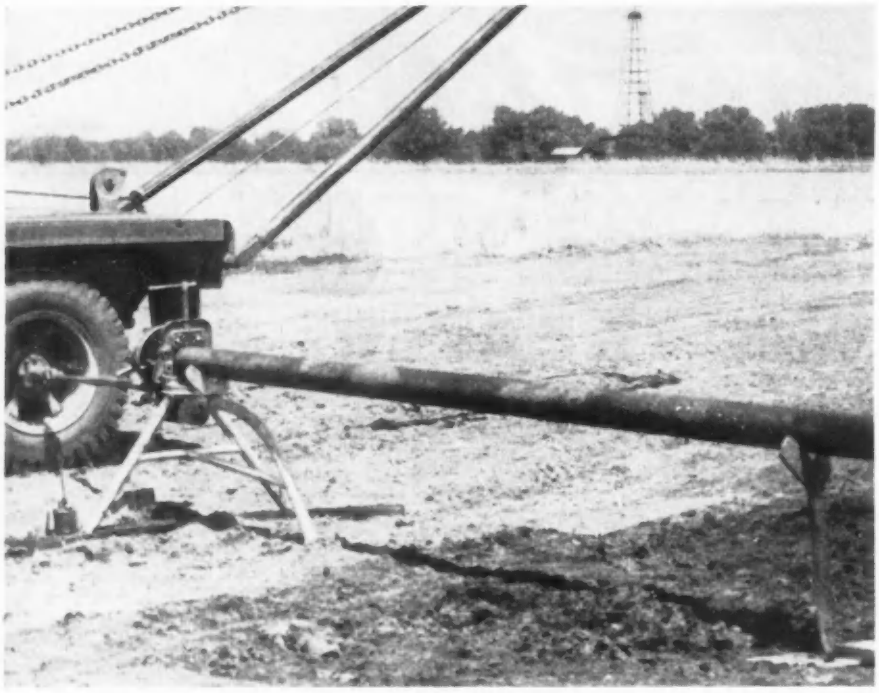


Pipe threading, a tedious job, is done in minutes by the gang-truck powered threader.

Portable Pipe Vise Speeds Threading and Cutting

HAZARDS in hand cutting and threading heavy pipe in the field have been reduced by an alert Shell Oil Company roustabout crew in the Voshell field of Kansas. Through ideas contributed by the crew members, an ingenious pipe cutting and threading device was fabricated that is powered by a floating shaft attached to one of the rear wheels of the gang truck.

Component parts of the device are light in weight and portable, and consist of a three-legged vise stand, two adjustable "Y" pipe supports, a power shaft containing two universal joints and an adapter or chuck that is bolted to the pipe for rotating it when cutting. Total cost was about $80, which field men believe is relatively small considering the safety and labor-saving features.

The three-legged vise bench was made from 1½-inch pipe on which was mounted the open-jaw vise. A vee plate welded to the third leg centered the pipe in the vise. The other pipe supports were made of 1½-inch pipe welded to a flat metal base. A telescoping section fitted inside the base section and was adjustable by means of a set screw welded to the base section. The "Y" support made of plate steel permitted the pipe to rotate with minimum drag.

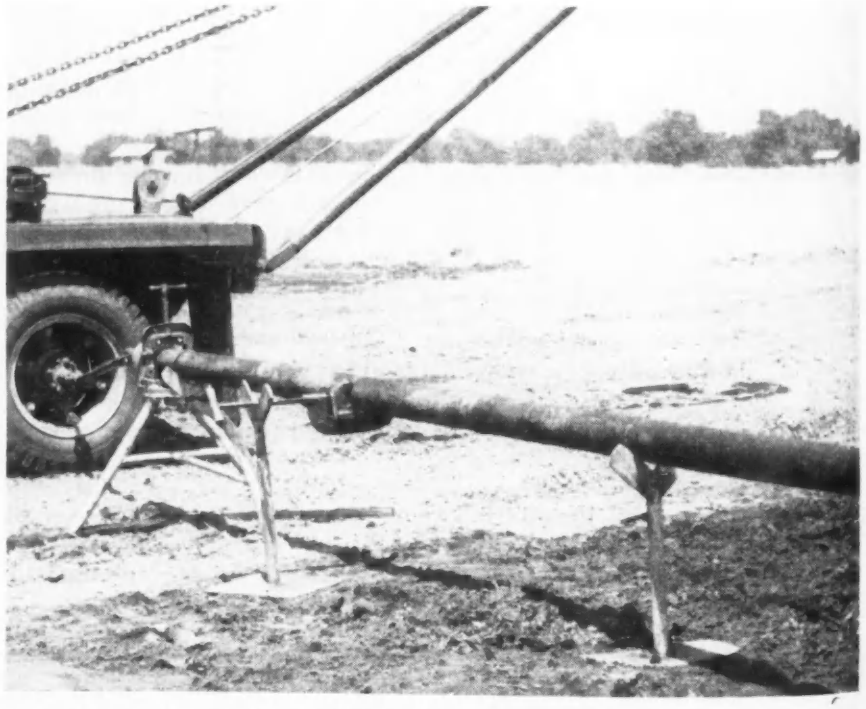
The power shaft was made from regular truck shafting, and was attached to the gang truck wheel by means of a web flange that bolted to the wheel hub. It was quickly detached by removing two hub bolts. In order to permit the truck wheel to turn, one wheel had to be jacked up so that it cleared the ground.

When cutting pipe, an adapted or pipe chuck was used. This device consisted of a short nipple of casing that was welded closed at one end and equipped with three set screws around the circumference of the open end. A square rod about 10 inches long was welded to the closed end to accept the box end of the power shaft.

The adapter was attached to the pipe to be cut by tightening the three set screws in the adapter. One of the "Y" supports held the pipe cutter in position. The cutter was started by hand, and then by rotating the pipe with the gang truck, the remainder of the cut was made quickly with the truck power.

In the case of threading pipe, the box end of the power shaft fitted over a square head on the thread cutter which was started by hand. When threading, the pipe was held stationary by the pipe vise, and the power shaft rotated the thread cutter.

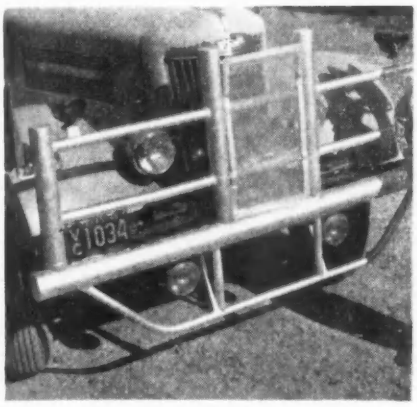
Use of this device has speeded up jobs in the field where flow lines had to be laid and where it was necessary to cut and thread pipe. It has reduced considerably the manual effort and increased the safety of such an operation.



Pipe cutting was done quickly and safely through use of this home-made power device invented by Voshell field men of Shell Oil Company.

How to do it! PRODUCTION HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas.



Truck Bumper Has Many Uses

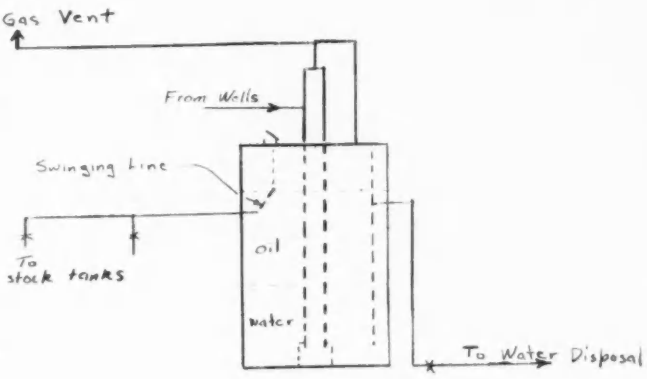
Nothing could be more varied in construction and design than the bumper and bumper guards found on modern trucks which service the oil fields of today. They have been fabricated to suit the ideas of truck drivers, welders and foremen, and to meet the many needs of the field. Here is a simple bumper guard that has many purposes and, from all appearances, it performs them well.

Not only does this bumper incorporate an extra heavy duty pipe guard, but it is equipped with light protectors, bug screen and fog light guards. Four heavy vertical pieces of pipe form the supporting elements of the guard that protects the road lights. Between the two center uprights, a piece of wire screen has been mounted to catch bugs, butterflies, etc., that plague the truck driver who must drive at night in the warm summer months. This screen was sewn to a metal frame which is temporarily wired to the bumper guards.

The two fog lights mounted below the bumper put the amber light directly on the road when visibility is limited by fog. To protect these lights from possible damage either from stumps or from other vehicles, a smaller guard was added to the central bumper member. Two angle braces extend back to the truck frame to provide extra support for this lower guard which was made from 1½-inch pipe.

Swing Line Simplifies Tank Hookup

A connection which actually eliminates the grasshopper leg entirely is simply a swinging line on the oil outlet connection so that the oil level can be raised or lowered, thus adjusting the water blanket in the gunbarrel.

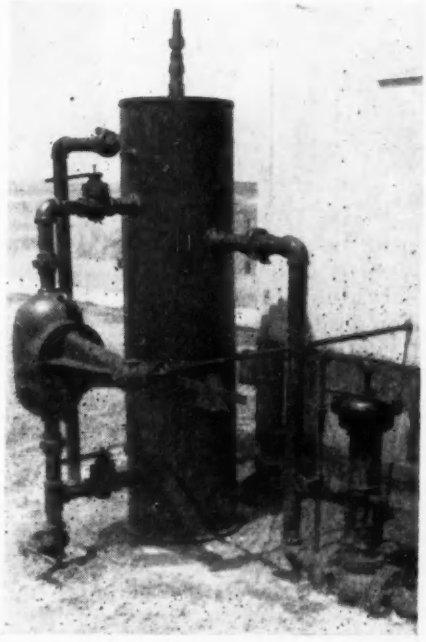


When the tank is built, a double flange is installed on the oil outlet to provide a female connection on the inside as well as the outside of the tank wall. The outside flange is given the usual connection to the stock tanks. The inside connection is attached to nipple and ell and a three-foot nipple. The end of the line carries a short piece of chain which runs to the hatch on the tank. A slot is cut in the hatch so that the links of the chain can be slipped down into it to adjust the height of the end of the swinging nipple.

The water outlet is hooked up solid with the connection about six inches below the oil connection. The vent on the salt water line is placed inside the tanks, creating a closed system in which no air comes in contact with the water. This condition prevents corrosion and facilitates disposal. The only attention necessary is the slight shifting of the outlet line to the stock tanks as shown.

Scrubber Float Stops Engine

An external float added to a shop-made scrubber was attached to a mercury switch to ground the magneto of a compressor engine should the liquid level in the scrubber reach a predetermined level. This safeguard was used on a small gas compressor in gas lift operations. Gas for the compressor suction was gathered from separators on the lease. This gas contained some liquids and moisture. A pressure regulator upstream of the scrubber maintained a constant suction pressure on the compressor. As the gas passed through the scrubber, liquids would form and drop to bot-



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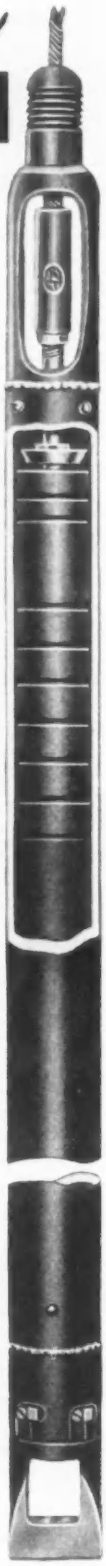

Chisel Bottom Illustrated

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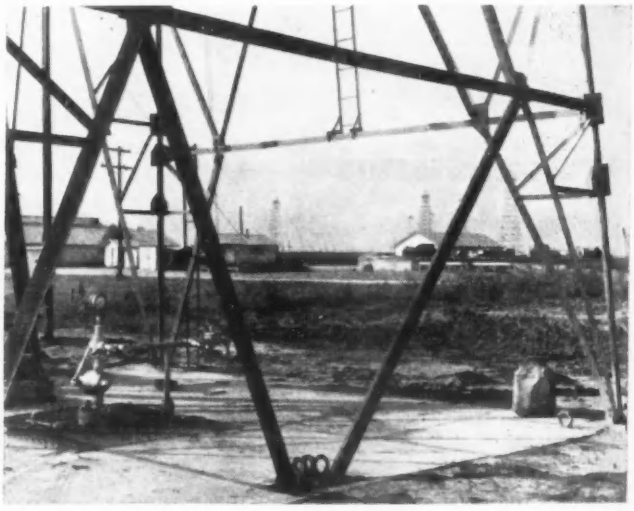
tom. If this liquid level rose too high, some of the liquids would be carried over into the compressor suction only to damage the unit.

The external float was connected to the scrubber by two 1½-inch pipe connections. The top line was an equalizing line and the lower connection allowed the liquid to enter the float chamber. A tee on the bottom line connected into a liquid blow-off line terminating in the burning pit. The float was pivoted at a point about 14 inches from the chamber, and a counterweight added to increase the sensitivity of the device. A ¾-inch rod was attached at right angles to the float arm so that any movement of the float would cause the rod to rotate.

This rod was extended inside the compressor house where it was connected to a mercury switch. When the switch was tilted, mercury inside the bulb would make contact with the electrodes and ground the magneto of the compressor engine. Such action would take place should the liquid level in the float chamber reach a predetermined height. In normal operating condition, the float was down, and the electrodes in the mercury switch were not in contact with each other.

Pulley Hold-Down Reinforced



Heavy four-inch pipe angle braces were added here to provide extra anchorage for the pulley hold down on a production type derrick. When a well is pulled, the pulling line feeds through the pulley anchored below the vee of the production derrick as shown. This pulley withstands all the pulling force and must be firmly anchored into the concrete pad surrounding the well.

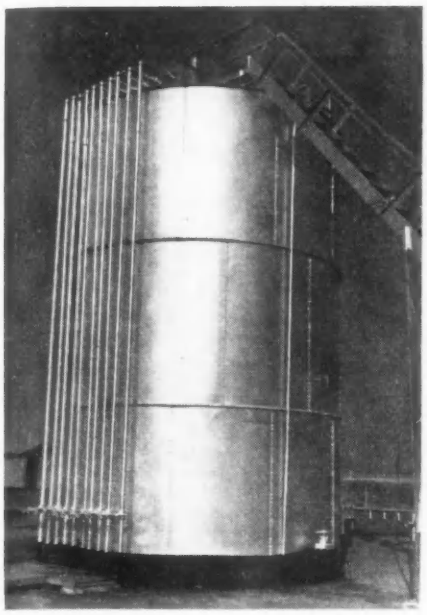
Before the concrete is poured, a piece of discarded drill pipe is placed in the forms, parallel to the outer edge of the concrete apron. This pipe is covered with concrete, and securely tied into the double eye hold down device. The pipe extends nearly the full width of the derrick and eyes are added at each end. These eyes are shown extending just above the concrete near the derrick corner.

On extremly heavy pulls, the hold down had a tendency to come out of the concrete pad. To prevent this, two vee braces were added. Since the pull resulted in a downward force on the derrick, the braces would provide an upward force against the derrick. Net result is an anchoring effect.

Upper ends of the four-inch braces are flattened and drilled to match holes of the intersection plate on the first girt and the vee braces. The bottom footing consists of heavy plates welded to the pipe and anchored to the ground block hold-down. In this case, the block hold-down is bolted to the concrete pad spanning the four legs of the derrick.

Salvaged Tank Is Lease Gun Barrel

A salvaged 750-barrel tank may be used as a gun barrel to handle fluids from many wells producing a large percentage of salt water. In this case, some 15 pumping wells flow into this single tank where much of the water settles out and is drained off through a syphon leg. Because water production is quite high, the water oil contact in this tank is maintained about four feet from the top edge. Ten two-inch well flow lines are shown entering the top of the tank on the near side. These lines are connected into a rectangular flume which extends about two feet through the roof of the tank. The flume extends down into the tank so that the water and



oil coming into the tank from each well has a chance to separate. Oil is taken off the top.

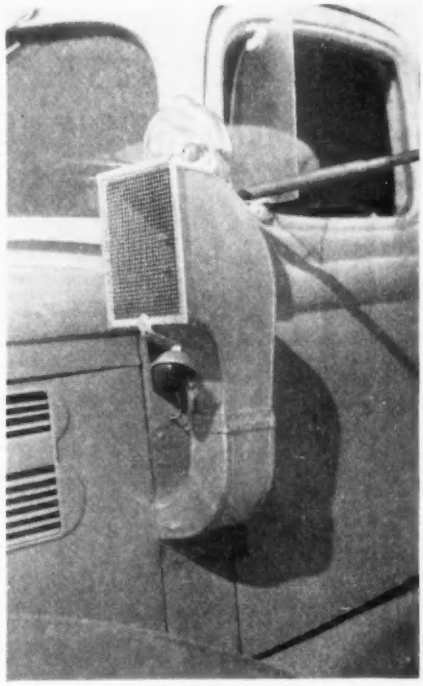
The rectangular flume is covered on top with a hinged lid that can be opened by the pumper to inspect the discharge from any well flowing into the tank. A walkway is bolted across the top of the tank so that the pumper may open the lid of both flumes, a second flume being located on the opposite side of the tank. The latter is visible in this view. The tank is equipped with cleanout plates and drain lines should it become necessary to inspect or clean the sediments from the tank. For testing purposes, each well is tied into a manifold that diverts the flow of fluids into a test tank to accurately measure the water-oil ratio. Such an installation, where applicable, eliminates the need of several gun barrel tanks, since the capacity of this tank is relatively large and can handle large volumes of water.

Air Scoop Cools Truck Drivers

Additional ventilation for truck cabs is provided by attaching an air scoop to either side of the body to direct a continuous flow of air towards the feet of the driver and helper. Made from galvanized sheet metal, each scoop is permanently attached to the cab as shown. Similar to a ship's ventilator, each scoop has an enlarged opening heading into the wind, with a narrowing neck that directs the air into the bottom of the cab.

Inside the cab on either side is a damper which is used to open or close the ventilator. A water drain is incorporated at the bottom of the duct where it curves into the cab body.

The unit may be either welded to the cab body after a hole is cut in the



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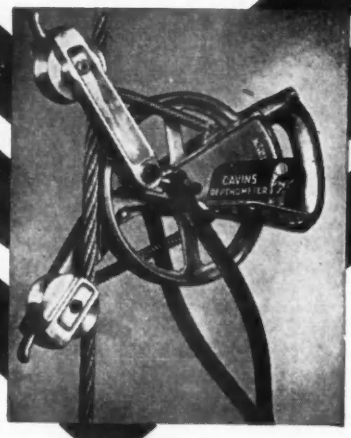

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will tell you where bottom is in little more time than it takes to make a trip with your bailer. Gives you accurate depth in plain figures—compensates for raising and lowering tools when feeling for bottom. Strong, light-weight, easily used, and priced right. Send today for illustrated folder.

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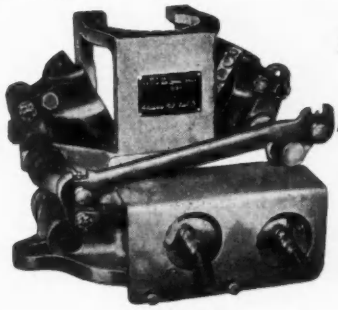

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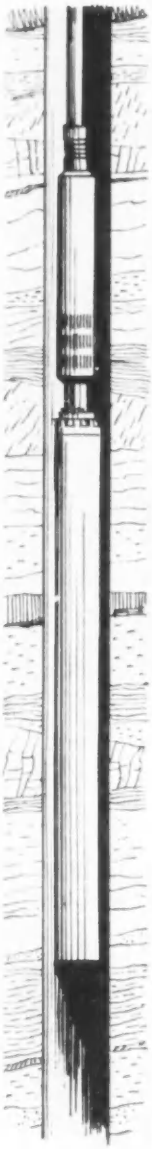

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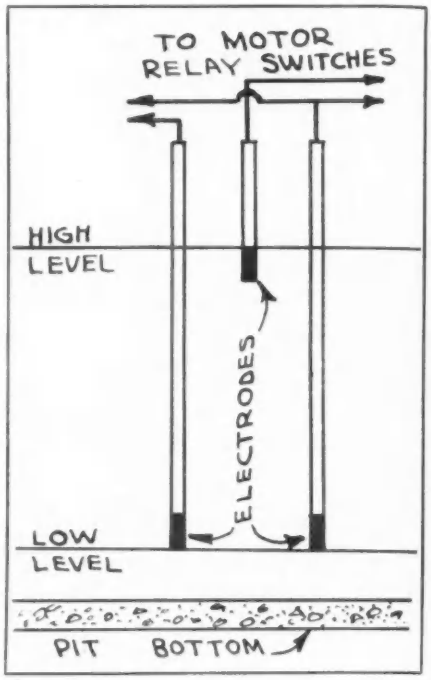
body, or it may be bolted to the body. A sealing agent or packing is used to seal off the duct where it enters the body. Added strength for the air scoop is provided by bolting a supporting brace near the upper section of the scoop. Screen wire clamped to the opening filters out bugs and foreign matter.

Disposal Pump Is Auto Controlled

A three electrode system in a salt water sump pit is the heart of an automatic control device for starting and stopping an injection pump. Initial installation of the disposal system is based on future salt water production. Prior to reaching peak water production, smaller volumes are handled, and an intermittent operating procedure is established.

Each injection pump is of the centrifugal type and is driven by an electric-powered motor. Water from each tank battery is collected through a gravity drainage system that terminates at a centrally-located treating station. Here, the water is allowed to settle and then skimmed off into the open sump pit.

Three electrodes make up the basic principle of the electric controls. These are of the carbon type and are surrounded by a breakwater that calms the water level in contact with the electrodes. Two of the electrodes are located at the low-water level, and a third at the high-water level. One of the lower electrodes is common to both the high and the low level control electrode. Electrical leads from these electrodes are connected to relay switches that start and stop the pump motor.



When the salt water level reaches the upper electrode, the motor starts. The starting switch is held closed by the circuit established through the two lower electrodes. As the water level drops below the lower electrodes, the motor is stopped and remains so until the water level again covers the upper electrode.

Well bore cross section. Dotted lines indicate wall reaming.

Clean Out Congested Wells

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Cross section view of torpedo

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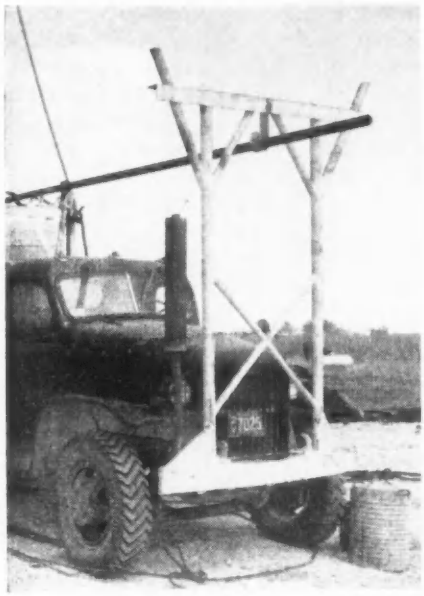

Rig Unit Frame Invaluable Aid

A unitized frame on the front of a well servicing unit holds up the mast when in over-the-road position, and also holds up the exhaust pipe of the main power unit while it is in operation on the well. This removes all exhaust flames from the vicinity of the well head in case the well tries to flow when it is being brought back on production.

The frame is built up from three-inch pipe which is welded securely to the frame of the front of the truck and the bumper. Besides cross members of two-inch pipe, the top carries two braces of 2½-inch pipe which brace the angle iron laid across the top to hold the weight of the derrick top. The inside braces are cut flush with the bottom of the heavy angle iron, and the outside braces are extended to make a nest for the top of the mast to prevent it from sliding off in case the roads are rough.

The exhaust pipe is extended by simply placing a J-shaped swing beneath the angle iron and welding it fast to make a slot for the exhaust pipe. In short moves, the exhaust pipe may be left intact, but on longer moves, it may be removed and carried along the side of the truck.

Disposal Line Is Protected By Casing

A salvaged joint of casing can be used as a supporting bridge for asbes-

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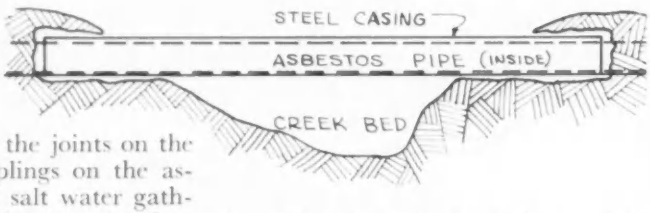
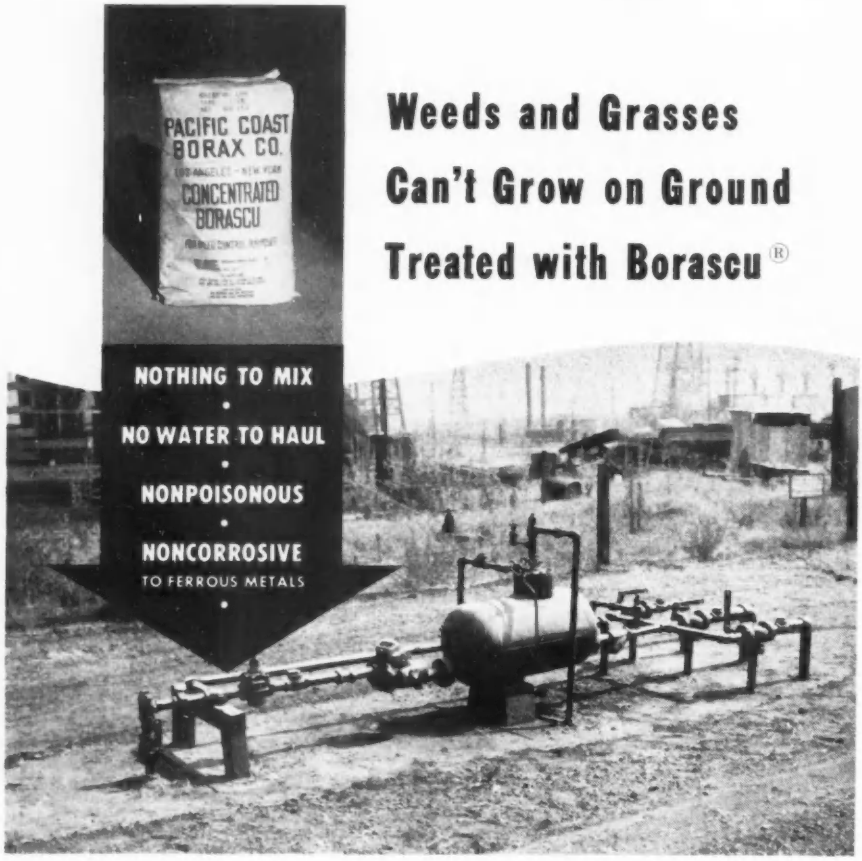
tos or tile jointed pipe used in salt water disposal service. The casing must be large enough to accommodate safely the joints on the tile line or the couplings on the asbestos pipe. In most salt water gathering systems where the water is taken from each tank battery and collected at a central treating station, advantage is usually taken of the terrain to provide gravity drainage.



In normal creek crossing, and particularly where the creek is dry, it is common practice to follow the contour of the bed, since the asbestos pipe as well as any tile-jointed pipe is not of sufficient strength to support itself across an open span. It would be hazardous in the cast of asbestos pipe to permit an open span, even though it be a short one, for it might be broken. In order to maintain a constant grade for gravity drainage in collecting salt water, short creek or ravine crossings may be made by inserting the salt water pipe inside a section of casing that is supported on each side of the span by sufficient earth footing. In one instance, old oil drums were welded end to end to make sufficient span to support a tile jointed line.



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When lines are buried, connections are used to bring plug valves up above the ground for easy operation. One operator buries the valves with the line and provides a tool for the switcher to operate the valve even though it may be a foot or more beneath the surface.

The wrench is made of ½-inch plate steel with a slot cut to fit the square on the valve plug. The slot is half way through the plate and the bottom of the extension is welded to it by means of a fork at the end. The fork is made with a wide mouth so there is plenty of space for the top of the plug. Top of the fork fits the bottom of the extension at right angles.

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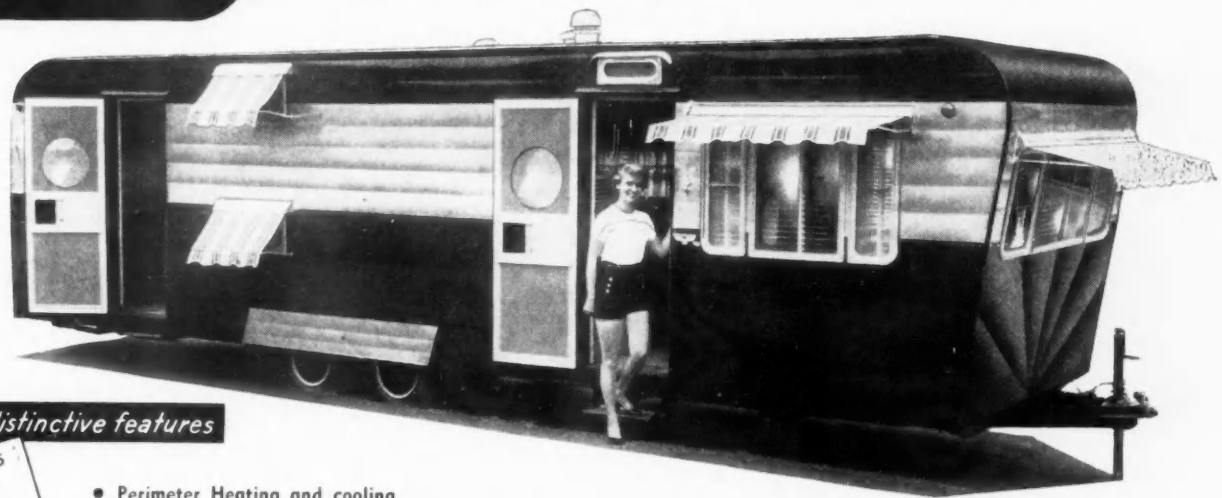

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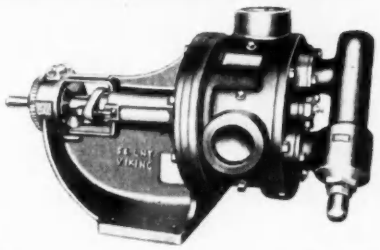

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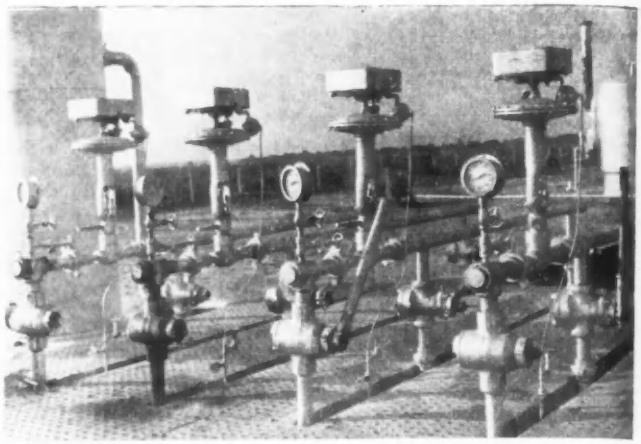
and the gate can be operated when it becomes difficult to rotate.

The pumper keeps the wrench in the dog house. On water lines which must be buried beneath frost level, this device to open buried valves is a necessity.

Intermitters on Line Control Flow

Shutting-in and opening flowing wells to conform to proration schedules can be greatly simplified at considerable time savings by using intermitters on the flow lines located at the tank battery. In one case flow lines from four flowing wells terminate at this manifold. To comply with proration schedules each well must be shut in a different length of time each day. These wells are strong producers and are not affected by daily shut in periods, for they resume flow without any difficulty.



Shut in pressures in each case is not great, perhaps less than 250 pounds per square inch. At the tank battery, each flow line connects into a header equipped with a gas-lift type intermitter, the function of which is only to open and close the flow line at predetermined periods. A bypass line is incorporated in the manifold should it be necessary to bypass the fluid around the intermitter valve.

Each header containing the intermitter has a removable choke to keep downstream pressures fairly constant. This insures a continuous flow into a common separator. Each intermitter can be staggered so that not more than two of the four wells flow into the separator at any one time, thereby insuring continuous operations of the battery so far as oil and gas flow is concerned. It is very little trouble for the pumper, whose office is located nearby, to wind the clocks on the intermitters each day, and check their operation. Should one or more wells need to produce more or less, the change in production schedule can easily be made at one central point.

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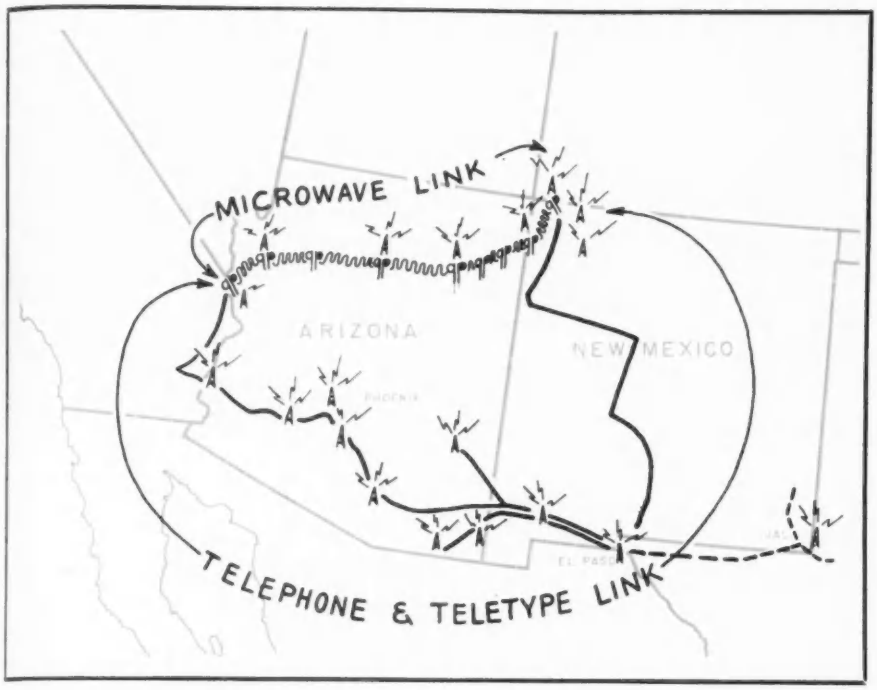


Route of El Paso Natural's circle of communication.

El Paso Natural Completes A Circle of Communication

System has 4600 miles of telephone line, 19 radio stations, 450-mile microwave link.

By **B. MARSHALL WILLIS**
El Paso Natural Gas Company

El Paso Natural Gas Company recently put a 450-mile-long microwave system into operation completing a circle of communication running from El Paso, through northwest New Mexico, across northern Arizona, down to Blythe, Calif., and then back to El Paso along the southern boundary of the U. S. This giant circle includes 4600 miles of telephone lines, 19 radio stations and the microwave link. All of these facilities are hooked together to make it possible, for example, to talk with Kingman, Ariz., via the northern route, or in case of trouble, via the southern leg of the communications circle.

El Paso Natural got into the communications business out of necessity. Operating in sparsely populated sections of the United States, the Company does not have available the public communications facilities generally available to pipe line companies.

When the first pipe line was laid in 1929, there were no communications facilities along the route. Sections of the line were from 50 to 100 miles away from the nearest existing telephone lines. In order that the Jal plant could communicate with El Paso, El Paso Natural had to put up its own telephone line.

As the company has grown, it has been possible to use public facilities to some extend. But most of the company's communications are carried over facilities built and operated by company personnel.

There are two circuits along the route of the original Jal-El Paso telephone line. Both have physical and carrier channels for voice communications carry teletype channels and are used for telemetering. A network of lines now spreads out from what was, at one time, the eastern terminal of the line in Jal. Several hundred telephones, some of them at plants 80 or 100 miles from the main office building of the Permian Division in Jal, are tied into the switchboard at that office.

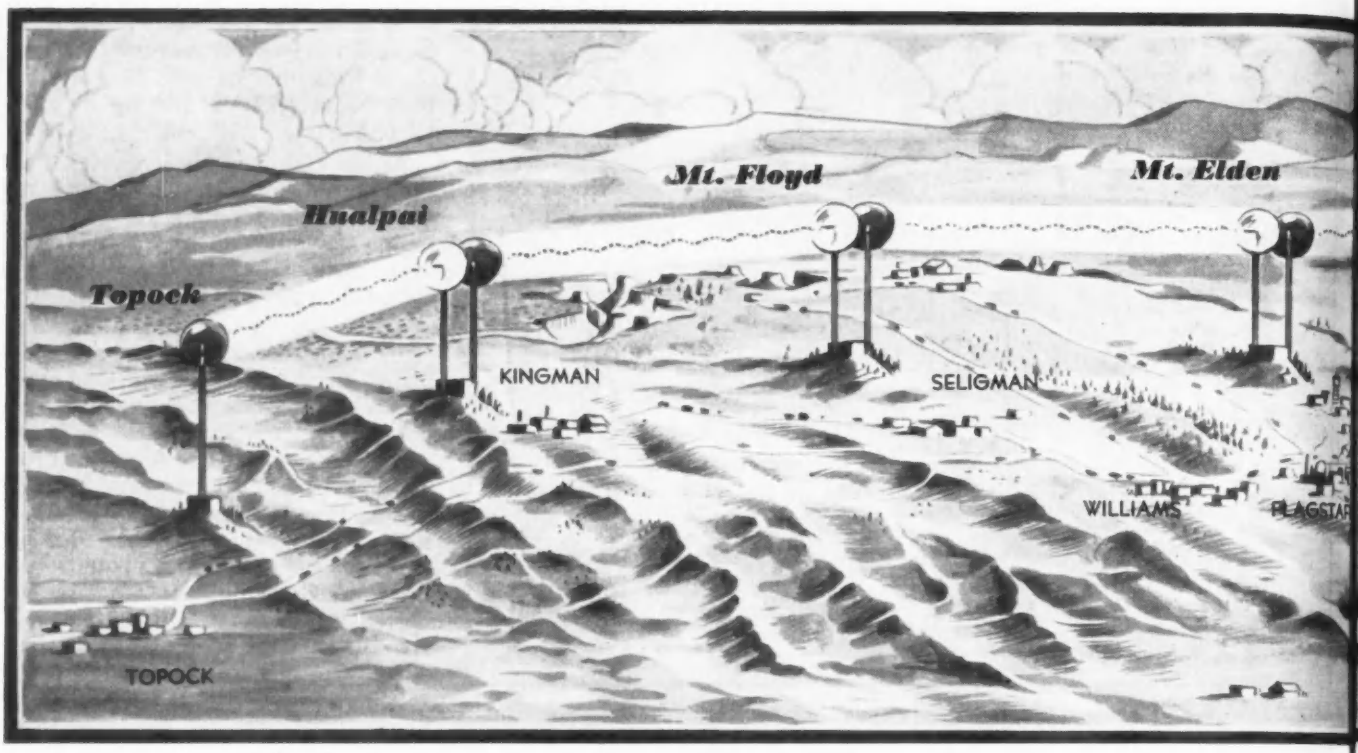
The recently installed microwave link, follows the route of the San Juan pipe line from northwestern New Mexico and southwestern Colorado across northern Arizona to the Arizona-California border. It is used for voice communications, telemetering, and for the operation of four VHF radio stations located at highly isolated spots along the route of the San Juan pipe line.

The company has 19 VHF radio stations, including the four mentioned above, which make it possible for all points along the main lines to be reached by radio.

Three Leased Circuits

In addition to these facilities which it owns, operates and maintains, El Paso Natural has leased three telephone circuits and one teletype circuit. One of these telephone circuits and the teletype circuit connect El Paso with Farmington, New Mexico, headquarters city for the main offices of the San Juan Division. The other two telephone circuits connect El Paso with all plants and offices west of El Paso in southern New Mexico and southern Arizona. There are 12 points tied-in to each of the circuits. Any of the plants or offices on either of these lines can talk to any of the plants or offices on the other line by calling into El Paso where the two lines can be connected by switchboard.

The leased telephone circuits connecting El Paso with Topock and El Paso with Farmington can be tied-in with the microwave link which connects Topock with Farmington, so that a complete circle of communications is possible. El Paso can com-



municate with any point on the microwave link by calling either Topock or Farmington and having the call placed on that link.

The operation of the wire circuits of the company would not seem to involve any technical data or information which is not already generally available to everybody. Carrier and physical channels are in existence on both of the company owned lines from Jal to El Paso. Telemetering is practiced at a number of points along the lines.

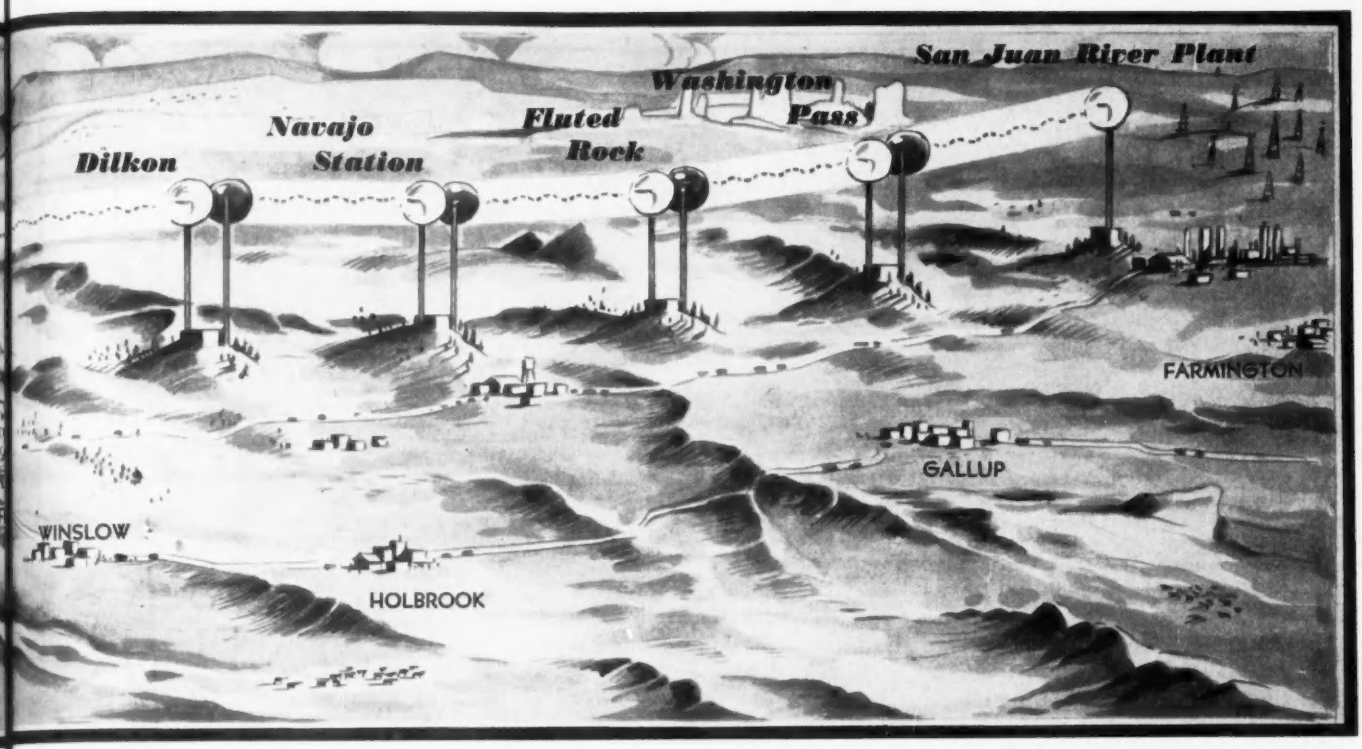
There is one unusual setup in telemetering which exists at the Topock office, however. It is 16 miles from the Topock office to Franconia Junction where the company's San Juan pipe line and the crossover line from the southern (Permian Basin) lines connect. One static and one differential pressure on the San Juan line and one static and one differential pressure on the 30-inch crossover line are telemetered over this distance. Further, because it is necessary to open and close the valves at the junction at comparatively frequent intervals. A setup, engineered by the company personnel, has made it possible for the Topock office to control the operation of the valves by impulses sent over wire. A telephone wire was not available for these telemetering and valve-control impulses. To avoid the cost of setting up a wire line, the Communications Department utilized a high voltage electrical wire which carries 2400 volts.

These two planned the present El Paso Natural communications system, one of the world's largest privately owned systems. Left is Lon G. Wainman, superintendent of electrolysis and communications, and right is Larry Duthie, who is in charge of communications for the company.

Benefit to Public

The telephone lines which are east of El Paso have proved to be of value to the public as well as to the company. There are still no public communications facilities in the area close to the Jal-El Paso pipe lines. Close to these pipe lines, however, is the heavily-traveled highway, U. S. 62. For 140 miles along this highway there are no public telephones.

Frequently there are bad accidents on the highway. This is particularly true in Guadalupe Canyon which lies at about the center of the communications-less-stretch of the highway. From Guadalupe Canyon to Carlsbad, New Mexico is a 70-mile drive; from the canyon to El Paso is a 100-mile drive. To drive into either city to summon police and medical aid would add a couple of hours to the time for aid to arrive. But, by word of mouth, the information has gotten around that El Paso Natural Gas Company plants have communications with El Paso. Several times per year someone ar-



Microwave link along San Juan pipe line. Average distance between stations is 49.2 miles. (Drawing is not to scale.) Longest skip is 81 miles. As an integral link in system, four VHF stations at Hualpai, Mt. Eldon, Navajo station and Washington Pass are microwave operated.

rives at one of these plants to ask for aid in an accident. The plant telephones El Paso; the personnel in El Paso, in turn, either send out aid from that city or call Carlsbad by long distance for aid when that city is closer to the accident than El Paso.

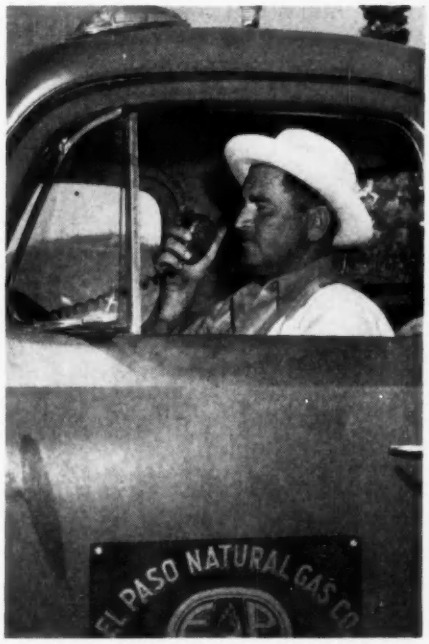
There are no public telephone lines connecting northern Culberson and northern Hudspeth counties with the southern portions of those counties. The law enforcement officers of both counties are stationed in communities in the south (Sierra Blanca in Hudspeth County; Van Horn for Culberson County). The company has plants in the northern portions of these counties and when shootings, accidents, and other occurrences call for law enforcement officers, telephone calls have been placed over El Paso Natural lines to El Paso; personnel in El Paso have then telephoned the information over the long lines of the telephone company to Sierra Blanca or Van Horn, whichever the case was.

The VHF radio stations were designed primarily to permit members of pipe line maintenance crews to communicate with one another. With the exception of six stations on the San Juan pipe line these radio stations are limited to about a 40- or 50-mile broadcasting radius. Thus, communications is from stations-to-car, car-to-car, or car-to-station, but not from station-to-station.

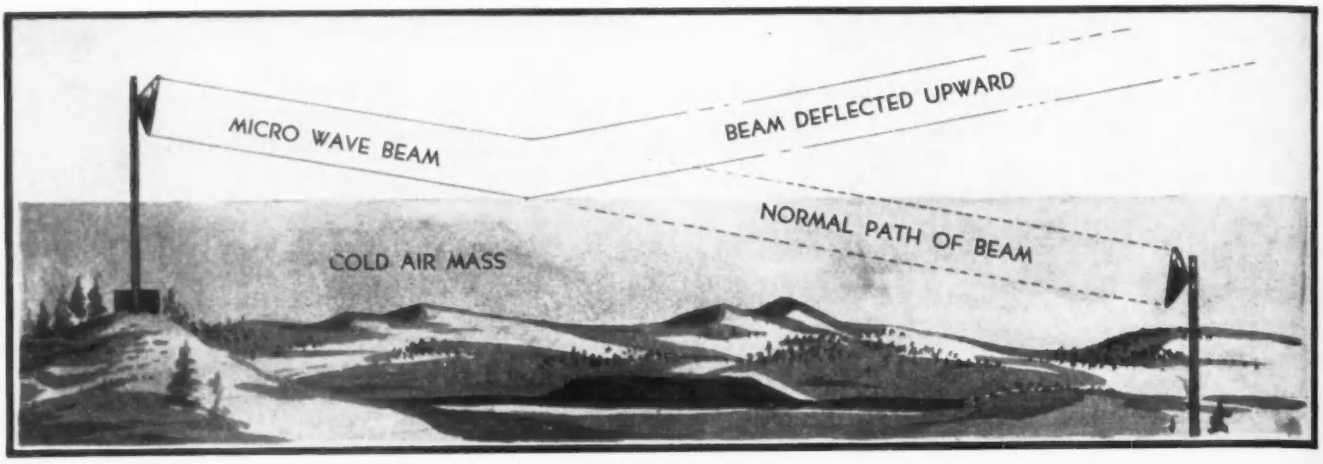
The VHF stations broadcast on a frequency of 48.74 megacycles. The company has 205 vehicles equipped with radio and has recently been authorized to increase this number to 250. The entire system has been surveyed for communication by relay using these radio-equipped vehicles. Thus, if the telephone lines or the microwave link should fail for any reason—an event which seems to be entirely unlikely—essential messages will be carried by means of radio relay.

This system was used for many months prior to the microwave link completion at the Navajo compressor station. There was no direct communication with the outside world. (This plant is in the center of the Navajo Indian Reservation and is 85 miles from the nearest shopping center. It is believed to be the most isolated natural gas plant in existence.) Information was given to and received from this station twice each day by radio relay. Two cars were stationed between Flagstaff and Navajo station. Flagstaff would radio Car No. 1; Car No. 1 would radio Car No. 2; Car No. 2 would pass the message into Navajo station. Then, of course, the answer would be sent back by the same method. This contact was established twice each day at specified times and proved to be of much value.

An unusual feature of the microwave link and of the VHF stations is that four VHF stations are an integral part of the microwave system. KOB 886 at Hualpai, KOB 885 at Mt. Elden, KOB 884 at Navajo station, and KKF 871 at Washington Pass repeater station can be turned on and off the microwave beam. At Flagstaff and at Navajo station, the stations are put on or taken off the beam by manual controls. At Hualpai and Washington Pass the VHF stations are operated by means of impulses



Mobile VHF radio sets play an important part in the operations. The company has 205 automobiles and trucks equipped with VHF radio.



Stormy weather helps microwave link. The diagram shows a layer of cold air building up in calm weather. It could interrupt service by deflecting microwaves. This can be expected early in the morning. On the other hand, stormy weather creates turbulence in the air, preventing stratification of layers of air, which prevents reflection of microwaves.

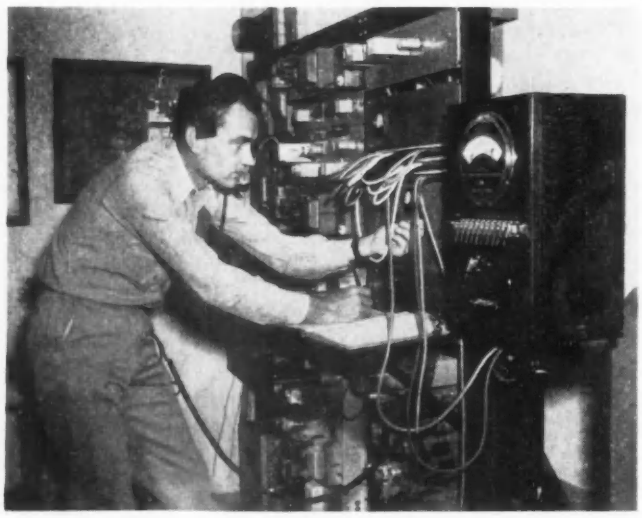
sent over the microwave beam itself.

Because the microwave beam, in turn, can be tied-in to the telephone lines there are almost unlimited possibilities for the use of these VHF stations with other communications facilities. It would be entirely possible, for example, for a conversation to be carried on between a plant in the Permian Basin and a company airplane flying across northern Arizona or New Mexico many miles from any office or plant of the company. The call would go from Jal to El Paso on company-owned lines, from El Paso to Farmington (or Topock) on leased lines; from Farmington to a VHF radio station by microwave, and by VHF radio waves to the airplane.

Each of the VHF stations along the San Juan pipe line will broadcast over a radius that covers the next two stations. Thus, in the event that the microwave link breaks down, VHF radio broadcasting can be used to fill the gap. In case both VHF stations and the microwave link fail at the same time, communications can be maintained among points along the San Juan pipe line by means of the microwave and telephone line "circle." If Navajo station could not reach Flagstaff by either microwave or by VHF radio, for example, it would send a message by microwave to Farmington, by leased wire from Farmington to El Paso, by a second leased wire from El Paso to Topock, and by microwave from Topock to Flagstaff. If—and this seems to be altogether improbable—the telephone lines, the microwave link, and the VHF stations failed simultaneously, then the radio-relay of radio equipped vehicles would be put into service. Altogether, the radios, the wires, and the microwave provide what seem to be entirely adequate guarantees of uninterrupted service.

El Paso Natural Gas Company's microwave system is different from other microwave systems in several respects. For one thing, the average path length (the distance from one station to another) is 49.2 miles as compared to about 19 miles for other existing systems. The Elden-Dilkon path is 81 miles, the longest yet used on the frequency of this system. This long distance is because of the mountainous terrain over which the San Juan microwave link extends. By transmitting from the tops of the highest mountains, the distance the microwave beam will reach is considerably lengthened. The mountainous terrain has made it possible for the San Juan link to operate with only seven isolated repeater stations rather than about eighteen semi-isolated stations which would have been necessitated on flat, prairie land.

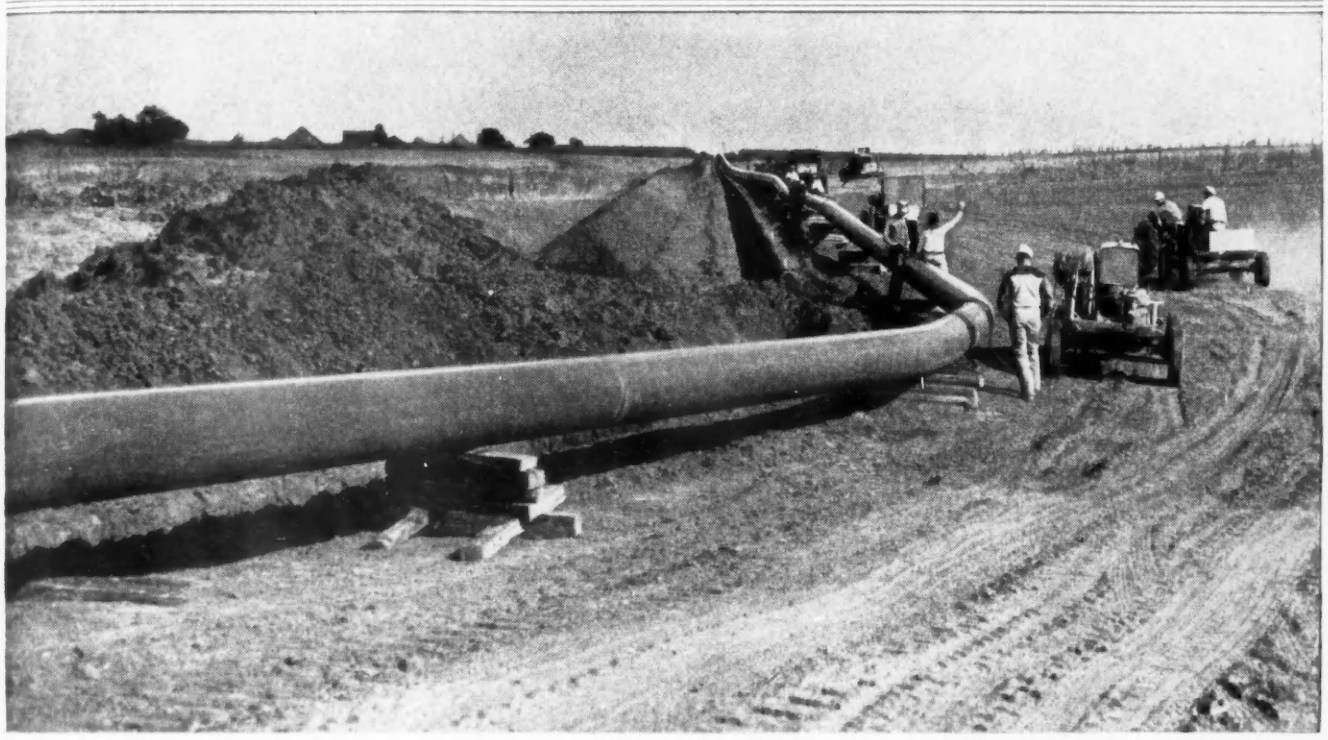
The mountainous terrain has also made it possible for wooden poles to be used instead of the high steel towers which are found in other microwave systems. On flatter land, towers up to 400 or 500 feet in height have to be



El Paso Natural employe Eddie Ekola checks the circuits for any irregularities at El Paso City Gate.

Dispatcher Willie Schreffler on the job at El Paso City Gate. Meters in background are operated by telemetering.

PIPE LINE PROGRESS



20-inch A. O. Smith line pipe being welded on the Rumsey Brothers, contractors, Nebraska spread of the Platte Pipe Line Company's 1,056-mile crude transmission line

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Big Horn, Wind River, Great Divide and Powder River basins of Wyoming and the Denver-Julesburg basin of Colorado and Nebraska supply the crude from existing producing wells, previously shut-in wells and recently drilled wells. By opening this Rocky Mountain area, new reserves and production from new drilling are now made available.

The pipe line begins in the Big Horn basin near Worland, Wyoming, and stretches in a southeastern direction across Nebraska, northeast Kansas and Missouri. Eastern terminal is Wood River, Illinois, from where other pipelines distribute the crude to refineries to the north and east.

A. O. Smith welded steel line pipe comprises more than half of this 20-inch main, a dominant factor in the completion of another great petroleum pipe line.

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DEPENDABILITY THROUGH RESEARCH AND ENGINEERING

Microwave system through northern New Mexico and Arizona makes use of mountainous terrain to reduce tower costs. Wooden poles such as these on a mountain top permit unusually long microwave paths.

A collapsible pole enables Jimmy Lowry of heavy maintenance section of Transmission Department to tap in on telephone circuits at any point. Spring tension keeps tight contact between line and pole.

used to offset the curvature of the earth. These high towers must be constructed of steel. The mountains of the San Juan area, however, make it possible to use 40-foot wooden poles which are much less expensive to install and to maintain.

Power is supplied to the stations at Topock, Hualpai, Mt. Floyd, and Mt. Elden from commercial lines nearby. At Navajo compressor station and the San Juan River plant, power is supplied to the microwave units from the electrical-generating facilities of the plants. The Dilkon, Fluted Rock, and Washington Pass repeater stations get their electricty from two kilowatt gas-engine powered generators which are built into the repeater stations themselves.

At all stations there is a gas-engine powered generator on a stand-by basis. If the original source of power fails, instruments automatically turn on the stand-by engine. When the primary source of power comes back on, the stand-by engine stops.

There are two 900-gallon gasoline tanks at each repeater station. This is enough fuel to keep an engine running continuously for 90 days. The Mr. Floyd and Washington Pass Stations are very isolated and, during winter storms, cannot be reached. It is felt that the 90-day supply of fuel is sufficient to keep the engines running until a truck can reach location to refuel them.

However, to be absolutely sure that the stations can be properly fueled, whether there is a storm or not, and to reduce the cost of hauling fuel, a diesel-powered electrical generating plant is being constructed at the base of the mountains on which these two stations are located. Power will be carried to the tops of the mountain by wire. Trucks will be able to reach the diesel-fuel tanks at the bottom regardless of how deep the snow is at the top of the mountain. The primary gasoline engine at each of the two stations will be moved to other microwave stations which are being planned. The stand-by engine will be left in place, of course.

There are a number of channels of communication in operation over the microwave link. There are, first of all, two voice channels. One of these is dedicated to carrying messages among the plants and offices along the line. The other is dedicated to operation of the VHF stations. (The channel for VHF operation can be used for point-to-point communications, too, of course.)

There are four channels for turning the VHF stations on and off. There

■ CONTINUED ON PAGE 212

About the Author

B. MARSHALL WILLIS is Advertising and Publicity Manager of El Paso Natural Gas Company.

In his six years with El Paso Natural Gas Company he has served, in addition to his present job, as accountant, measurement engineer, and editor of The Pipeliner, the company magazine. Prior to starting work with El Paso Natural Gas Company he was, for one year, senior engineer of a firm manufacturing instruments and valves and, for three years, market and sales analyst for United States Rubber Company.

He is a graduate of Texas Western College and of Harvard University's Graduate School of Business Administration.

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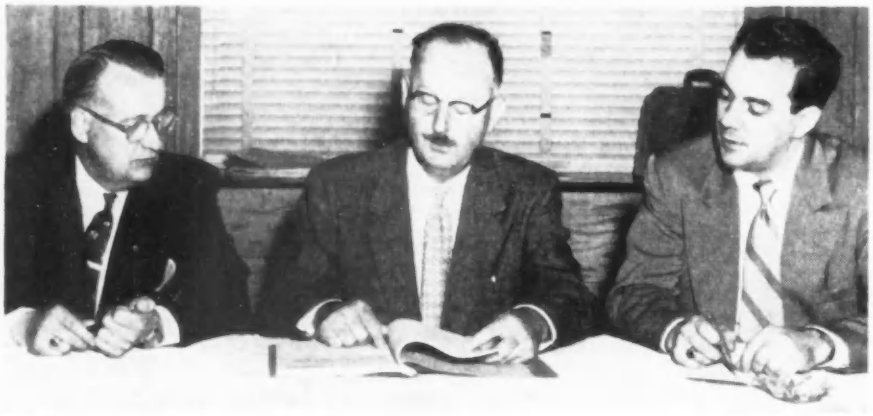


Examining the newly compiled code from Sections 2, 6 and 7 of ASA B31 Code of Pressure Piping are, left to right: Carl T. Kallina, chief of Division of Gas Certificates, Federal Power Commission; F. A. Hough, vice president Southern Counties Gas Company and chairman of ASA subcommittee 8, and Fredric Moshier, assistant to director of AGA Natural Gas Department, New York. Photo was taken at Houston meeting in October.

Subgroup studying pipe is headed by Charles F. de May, center, vice president and chief engineer, Columbia Gas System Service Corporation. Left is Lloyd R. Jackson, assistant director, Battelle Memorial Institute, and right is Maury Banta, research supervisor, Battelle Institute.

New Code for Gas System Piping Is on the Way

Leading industry authorities work for early revision of ASA regulations.

By DONALD M. TAYLOR
WORLD OIL Staff

THE DESIGN, CONSTRUCTION and operation of gas systems are under careful scrutiny of an American Standards Association subcommittee. This subcommittee is composed of 65 of the leading U.S. authorities on gas piping, whose aim is to expand and modernize the code for gas piping.

At a three-day meeting December 1-3 in New York, the gas company engineers and executives, the valve, pipe and fittings manufacturers, consulting engineers and research men who compose the group worked 14 hours a day at their monumental task. They tore apart and analyzed the existing gas piping code which, until recent months was loosely scattered throughout Sections 2, 6 and 7 of the ASA, B 31 Code for Pressure Piping. At the same time they rehashed work from previous meetings. Some of the decisions they made will, if approved by ASA, affect the design, construction and operation of gas companies for years to come.

The New York meeting is the fourth three-day meeting held since the committee was first organized last July. A fifth meeting is scheduled early in February.

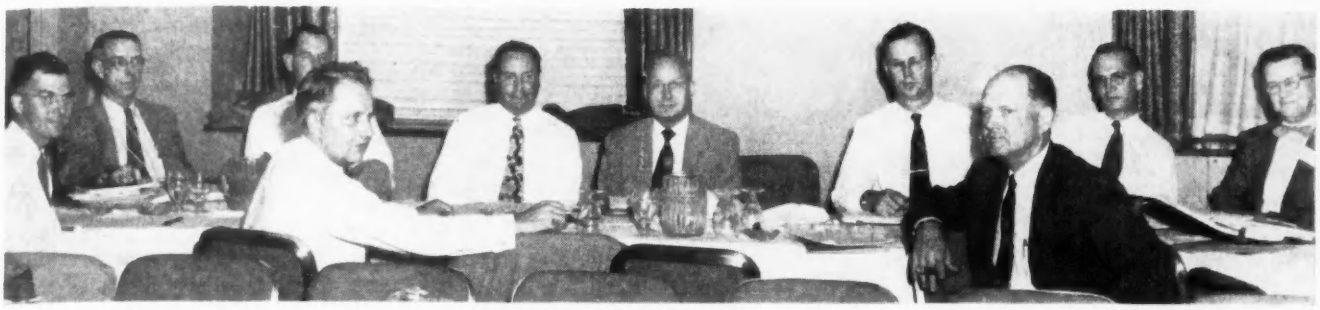
This group's penchant for hard work grows out of the gas industry's realization of the great need for a code which takes into account the advances made in manufacture of materials and the advances made in design and construction of pipe lines. Too, it is an outgrowth of the industry's desire to abide by a set of uniform regulations rather than be subject to individual piping codes of various state governments.

Officially, the group is known as Subcommittee No. 8 on Gas Transmission and Distribution Piping of the Sectional Committee on Code for Pressure Piping, B 31—or just plain B 31 Subcommittee 8. It operates under the procedure set up by the ASA and is sponsored by the American Society of Mechanical Engineers. Its membership comes from 37 different organizations including American Gas Association, Federal Power Commission, Independent Natural Gas Association of America, Battelle Memorial Institute and others. The subcommittee's chairman is F. A. Hough, vice president of Southern Counties Gas Company. He is assisted by two vice chairmen, Walter H. Davidson, general superintendent of Transcontinental Gas Pipe Line Company and Charles F. de May, vice president of Columbia Gas System Service Corp. The secretary is C. T. Schweitzer, staff engineer of Southern California Gas Company.

Two-Phase Job. The work of the group is being done in two steps. The first step, now complete, was to combine into one single document all of the portions of the B 31 Code which related to gas piping. The purpose of this compilation was to prepare a basis for a code revision and at the same time to provide the gas industry with a working code for construction now in progress. This step was finished in October.

The second step planned by the group calls for the revision and expansion of the code. And it is into this phase of the project that the committee has poured thousands of man hours. This task will be complete only after the code revision has been finished, approved, and published and in the hands of all gas companies. Target date for completion of this step is the spring of 1953.

To pursue its task, Subcommittee 8 has divided itself into eight subgroups—each one concentrating on one particular aspect of the revision and expansion of the code. The first one is concerned with scope of the revised Section 8. This subgroup, whose membership is composed of all of the



Subgroup on distribution pictured at Houston meeting. Chairman F. G. Sandstrom, Consolidated Edison Company of New York, is fourth from right.

Subgroup on pipe line construction and operation at work. At extreme right is Chairman Walter Davidson of Transcontinental Gas Pipe Line Corporation.

. . . the ASA subcommittee in session at Houston

Members of the subgroup on pipe line design stresses are, left to right: C. T. Schweitzer of Southern Counties Gas Company; William E. Wilburn, The Fluor Corporation; B. T. Mast, Tennessee Gas Transmission Company, chairman; K. E. Crenshaw, Gas Advisers, Inc., New York; Prof. M. G. Spangler, Iowa State College; C. D. Alstadt, Columbia Gas System Corporation, and A. J. Del Buono, Michigan Consolidated Gas Company.

Subgroup on fabricating details and mechanical design meet. Left to right are: Stephen A. Bergmann, Panhandle Eastern Pipe Line Company; C. D. Aldstadt; Chairman Frank S. G. Williams, Taylor Forge Pipe Works and ASA's chairman of the Sectional Committee on B31, and James W. Hall, Transcontinental Pipe Line Company.

At a session of the subgroup on compressor stations are, left to right: John F. Eichelmann, El Paso Natural Gas Company; M. C. Madsen, Northern Natural Gas Company, chairman; F. G. Crawford, The Fluor Corporation, and C. F. Koenig III, De Laval Steam Turbine Company.

chairmen of the other seven subgroups, must decide just what should be included in the code, just what should be left out. Its chairman is John F. Eichelmann, chief engineer of El Paso Natural Gas Company.

A second subgroup is concerned with pipe line construction and operation. Walter Davidson, Transcontinental Gas is its chairman. This group is formulating that portion of the code which will deal with such matters as what kind of tests are to be performed on pipe lines after they are complete. What roads should be cased? How should pipe be welded? What test should be given welders for qualification?

One of the most important phases of the work is being carried on by a subgroup headed up by B. T. Mast, supervising engineer, Tennessee Gas Transmission Company. This group, whose membership leans heavily toward design engineers, will find answers to such questions as what is the maximum allowable working pressure for a pipe line and distribution system. They are weighing such factors as welded joint efficiency, external loading, exposure of pipe factor, etc.

Working hand-in-glove with the design stress group is the group studying pipe.

Its chairman is Charles F. de May, vice president of Columbia Gas System Service Corp., New York. Among the members are many outstanding research men from leading universities, from steel mills and from research foundations. They are outlining research projects for future studies on pipe manufacture and pipe chemistry, and at the same time they are evaluating present day pipe.

Another subgroup closely related to the others is working on the sections of the code dealing with fabricating details and mechanical design. It is headed by Frank S. G. Williams, manager of engineering standards, Taylor Forge and Pipe Works, New York City, who also is ASA's chairman of the Sectional Committee on Code for Pressure Piping, B 31. This subgroup is concerned with fabrication details of tees, ells, saddles, etc., and methods used in their manufacture.

M. C. Madsen, chief engineer, Northern Natural Gas Company, heads a subgroup studying compressor stations. The group will make recommendations on such matters as shutdown equipment, safety valves, electrical work, vibration, corrosion, etc., which may affect compressor station design and operation.

A subgroup on distribution has F. G. Sandstrom, of Consolidated Edison Company of N. Y., as chairman. It is concerned with safe distribution practices.

One of the most dramatic studies being made by a subgroup is that on investigation of transmission and distribution facility failures. Stephen A. Bergmann, assistant chief engineer, Panhandle Eastern Pipe Line Company, is chairman. This group is analyzing all known failures and their causes. Its work is predicated upon the premise that eliminating the known causes of facilities failure will minimize failures. All of the other subgroups are posted on this committee's work.

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Circle of Communication

■ CONTINUED FROM PAGE 208

are six fault-alarm impulses which turn on signals at the terminals if any repeater station fails.

On the microwave beam from Farmington to Topock, there are two impulses used for telemetering. These carry to Topock pressures occurring on the discharge side of the San Juan River plant so that the Topock dispatchers are constantly informed of the amount of gas being delivered into the San Juan main line by the San Juan River plant.

The present microwave equipment is frequency division multiplexing using suppressed-carrier single sideband carrier equipment of the type used in commercial telephony. If, in the future more communications are needed —and this seems to be almost a certainty—the microwave beams can be loaded with an additional eight voice channels or sixteen channels of telemetering, control, of teletype impulses or any combination of these. This expansion can be accomplished merely by adding additional channeling equipment to the already existing microwave facilities.

If more than eight additional voice channels are needed, up to 24 voice channels can be thrown onto the microwave system by changing the channeling equipment without, however, redesigning or changing the microwave system, itself. This would be accomplished by substituting pulse amplitude or pulse time multiplexing for the frequency division multiplexing.

The communications system of El Paso Natural Gas Company has been of tremendous value to all of the personnel of the Company. In operations, by providing fast flow of information from point-to-point and hence fast adjustment of plants with each other, it has played a key part in helping the Company develop its 91 percent load factor. In construction, it has been of great value in moving equipment, materials, and manpower to locations. It helps the administrative personnel of the company to obtain information in a hurry and to get proper action started without delay.

For the future, the company is planning a microwave link throughout its Permian Basin operations for use, primarily in telemetering. This, in conjunction with the already existing facilities, should give El Paso Natural Gas Company one of the more satisfactory private communications systems in the country.

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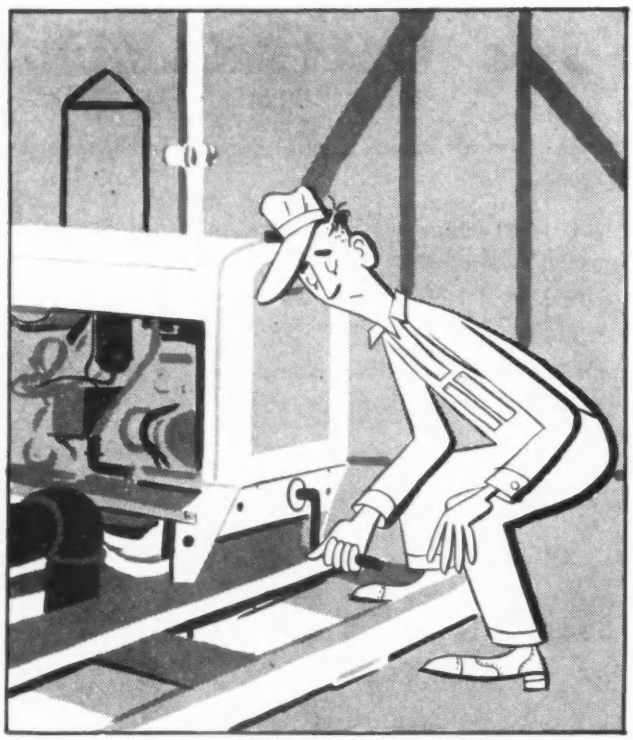
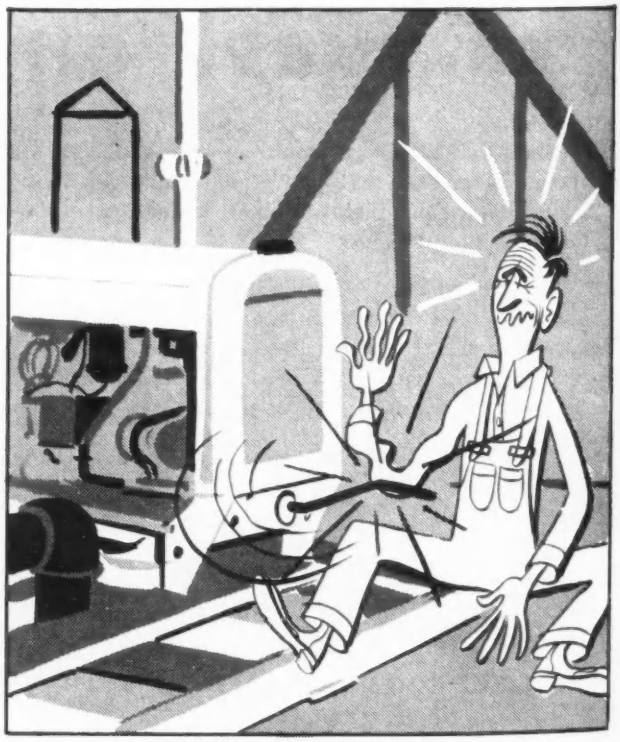
Perils of Pipeline Pete

Pete forgot to check on the brush gang before he started grading with a bulldozer—Crunch!





Here's how Pete learned that the best way to crank an engine with an impulse magneto is to give the handle a short upward pull and release it.

-it's UNIBOLT, all welded!

A cycling plant operator in Oklahoma makes good use of UNIBOLT Adjustable Wing Valves, Tees, and Couplings in a 3000 lbs. w.p. multiple-well gathering manifold. One section of the gathering system is shown in the above photograph.

Note that all of the fittings are provisioned for butt or socket welding. The use of Unibolt Couplings facilitated shop fabrication and testing of each unit before assembly in the manifold. The elimination of flanged connections substantially reduced the bulk and weight of the manifold without sacrificing strength, to say nothing of the time saved. Any unit in the manifold may be easily dismantled by simply releasing the Unibolt Couplings. The Adjustable Wing Valves provide accurate and dependable control of the production from each well, or a pressure-tight shut-off if needed.

THORNHILL-CRAVER COMPANY

P. O. BOX 1184 UNIBOLT HOUSTON, TEXAS

One section of Rancho Pipe Line System's 24-inch dual crossing at the Colorado River near Smithville, Texas. Similar dual crossings with gunite coatings were made at the Brazos River on the 455-mile trunkline connecting West Texas oil fields with the Houston-Texas City refining areas.

Shell Pipe Lines Crisscross Seven States

FROM A SINGLE four-inch pipe line of 16 miles in the 1900's second decade to more than 5800 miles of trunk and gathering lines in seven states in 1952—this is the progress story of Shell Pipe Line Corporation.

Both crude oil and refined petroleum products are transported through lines of this common carrier corporation. Its facilities stretch from oil fields in New Mexico, Texas, Oklahoma and Kansas to the Gulf of Mexico and to Wood River on the Illinois side of the Mississippi River. A products line extends from the Houston refinery area to Baton Rouge, La.

Shell Pipe Line had a modest inception. It came with purchase of the Yarhola Pipe Line Company, which consisted of 16 miles of four-inch line from the prolific Yarhola leases near Drumright, Okla., to a refinery at Cushing. However, expansion came quickly with the laying of a six-inch line from Healdton to the Cushing refinery.

In 1918, Shell (which still retained the name Yarhola) was the center of nationwide attention when it laid a ten-inch line across the Mississippi River. This was part of a trunkline which totalled 426 miles and connected Cushing to Wood River, Ill. First crude passed under the river July 18. The following year, when Yarhola became Ozark Pipe Line, the system had grown to 697 miles of crude oil pipe lines. Eight years later the name Ozark was changed to Shell Pipe Line Corporation.

Meanwhile, with production booming in various parts of Kansas, Texas and New Mexico, Shell Pipe Line laid a ten-inch line from the new fields in West Texas to Cushing and on to Wood River. This gave Shell Pipe Line parallel ten-inch lines with a daily throughput of 85,000 barrels from Cushing to Wood River.

In 1929 came another major expansion of the system. To supply a rising demand by Gulf Coast refineries, Shell Pipe Line built 446 miles of ten-inch line from West Texas' McCamey Field to Houston and another ten-incher into that city from Kilgore, center of the great East Texas oil field. By 1936, Shell had 3600 miles of main trunk lines carrying crude from fields to refineries.

At the request of the Petroleum Coordinator for War, Shell Pipe Line joined five other pipe line companies in financing and building the Bayou Pipe Line System in 1942-43. This line delivered sorely needed refined petroleum products from the Houston-Texas City and Beaumont-Port Arthur area to the Plantation Pipe Line at Baton Rouge for further movement to southeastern terminals. Shell Pipe Line was chosen to design, construct and operate the Bayou System. Today the emergency wartime project continues full scale operation in the shipment of products.

Shell Pipe Line is a participant in several other "multiple ownership" pipe line systems. One is the Basin Pipe Line, a combination of 20-, 22-, and 24-inch diameter pipe running from Jal, N. M., to Cushing, Okla. Here the Basin connects with the Ozark Pipe Line System (another joint venture system) in providing a thousand miles of main artery from West Texas and New Mexico to Wood River and Patoka, Ill. Shell operates the Ozark while The Texas Company operates the Basin. Shell is also a participant in the Sterling Pipe Line System, a 10- and 12-inch line from Logan County, Colo., to Gurley, Neb.

Shell's latest multiple ownership project is the Rancho Pipe Line System now under construction with expected completion date set for March 1953. Shell is building and will operate this 455-mile, 24-inch trunkline from McCamey, Texas, to Houston.

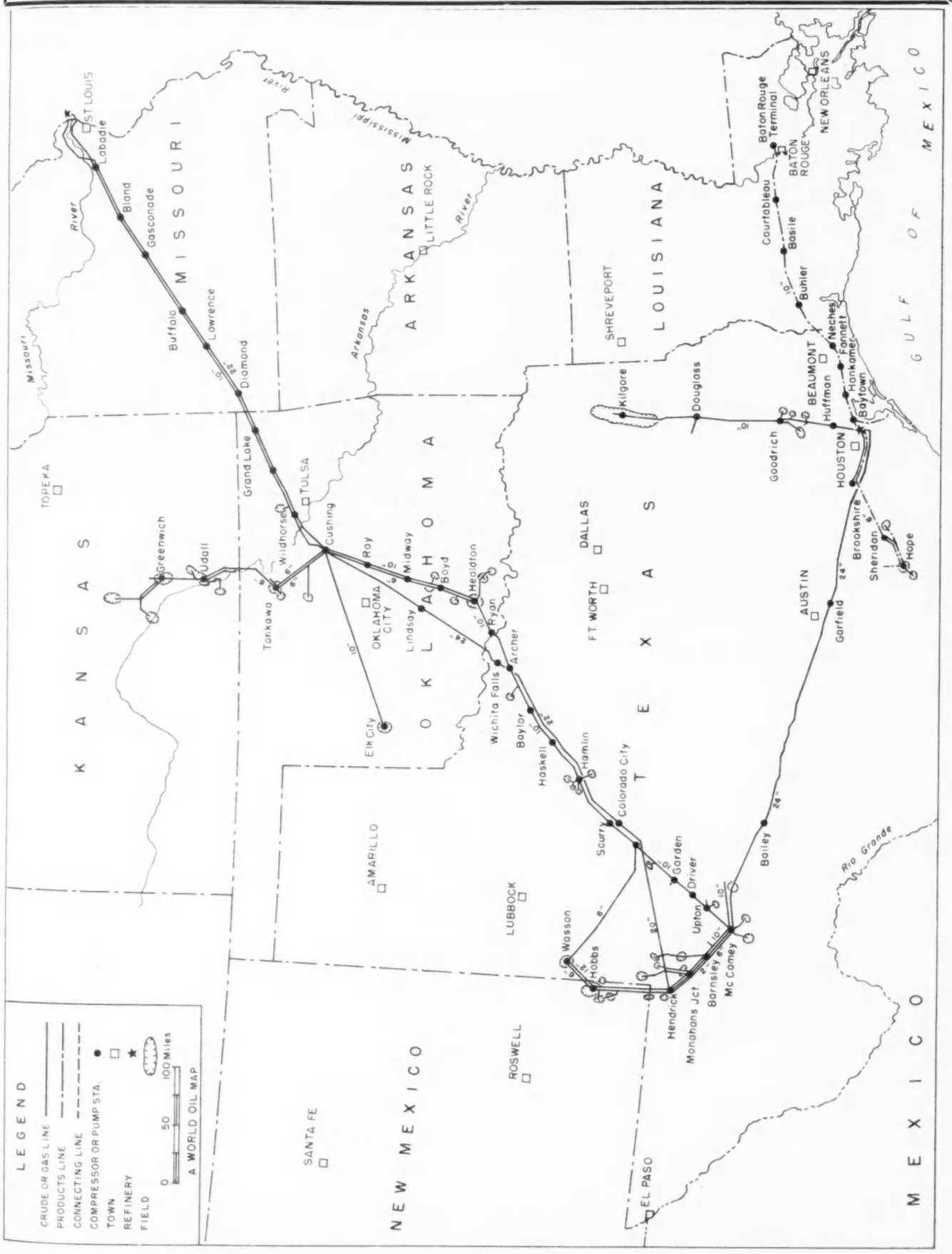
Shell Pipe Line's head office has been in Houston since 1940 when it was moved from St. Louis. The pipe line system is divided into three areas: Texas-Gulf, headquarters in Houston; Mid-Continent, with offices in Cushing; and West Texas, located in Colorado City, Texas. Corporation officers are T. E. Swigart, president; W. A. Baker, D. H. Lewis, P. H. Swinchatt and D. F. Sears, vice presidents (Baker also serves as treasurer); and A. E. Groff, secretary.

No. 2 of a Series

SHELL PIPE LINE CORPORATION

(Including Rancho, Bayou, Basin and Ozark Systems)

Map of the Month



H. H. Anderson

Versatile veteran enters new field at height of usefulness to industry and nation.

H. H. ANDERSON
. . . for him another challenge

By AL REESE
WORLD OIL Staff

"I HEAR YOU'RE a friend of Hal Anderson."

"That," replied the Shell man, "is about the highest compliment you could pay me."

He spoke with affectionate awe, which is an approximate composite of the tone reserved in Shell Pipe Line Corporation for H. H. Anderson, already an Olympian legend in office and field, though he only recently retired as vice president and general manager and accepted a like position with Trans Mountain Oil Pipe Line Company.

The composite note has undertones by groups, for Hal Anderson is many things to many people.

To a few associates the big man is, fondly, "Double H, a great guy."

To thousands of his former employes who knew him best by his deeds, he is, with hearty respect, "Mr. Anderson, the working man's best friend."

To people who foster red tape and to engineers who won't try to write better reports, he is, in painful memory, a frosty Jove enthroned in impatient judgment.

To the remainder of the industry, he is an outsized wizard whose white-thatched head moves above the crowd wherever important things are being done, whose voice is heard wherever important things are being said. Accomplishments plucked at random from his record emphasize his versatility:

- He supervised the construction of Shell's 30-story office building in San Francisco.
- He earned a commission in the Army Signal Corps during World War I by developing the formula, still used, to compute the ascensional rate of meteorological balloons.
- He conducted the first extensive investigation of the properties of drilling muds.
- He helped design the first API sucker rod thread.
- He developed the ton-mile formula for measuring wire rope service.
- He introduced electric- and diesel-driven rotary drilling, as well as the first portable outfits, in California.
- He managed a refinery and gasoline plants at Coalinga; he was chief engineer of the production department; and by turns he headed up transportation and supplies, personnel and public relations and pipe line operations.
- He was never an oil marketer, yet he sold more than 200 diversified industrial firms on taking corporate memberships in NACE.
- The government and the industry, particularly the API, have recognized and used his knowledge of labor problems, vocational training, economics, industrial safety and practical technology.

His talents seem endless, yet he readily admits to only one: that of developing assistants to do the regular work, freeing him to do the unusual and to serve the industry.

This talent he insists on sharing with his subordinates, to the end that nowhere is employe morale higher than in Shell Pipe Line Corporation, and everywhere there are stories born of his conviction that no man should be indispensable.

He hates liars, abhors stuffiness. To an associates's secretary who for a third time answered a direct telephone request for her boss with, "Who's calling, please?" he snapped: "This is Hal Anderson. Shall I send up my card?"

His directness is a barb which sometimes threatens the casual caller when he is engrossed in another problem. A WORLD OIL reporter went to him several years ago with a story idea too nebulous to allow the preparation of questions in advance.

Shortly after the interview opened Anderson said: "Young man, I don't think you know exactly what you want. Why don't you come to see me another time?"

But 30 minutes afterwards, Anderson had his teeth in the idea and was personally digging up facts for the article with as much furious enthusiasm as if he were preparing a major speech.

This personal digging is, indeed, the Anderson method of preparing a talk. No "ghost" has the indestructibility it would take to write for Hal Anderson.

Once completed, his papers are compact, polished, lucid. Every engineer who ever worked for him believes he could have been a great editor, though few might elect to be his reporters.

They tell of the time a young engineer laid a two-page report before Anderson and sat in squirming, sweating silence broken by the whispers of a sharp pencil disemboweling the fruits of his toil. At the end, he staggered into the hall and moaned to a long-time Anderson associate: "I'm gonna be fired! Look what he did to my report."

The old-timer grinned. "Young fellow, I've worked with Hal for years without realizing my ambition of having him pass just one single-page policy letter without improving it."

Yet Anderson is known to have completely rewritten several long technical reports for his associates and subordinates after dragging the pertinent facts out of them, as with a corkscrew. Invariably, he insisted that he get no credit line for the result.

When on the line, he operates on schedule, lets nobody know where he's been or going. Any time of day or night his big black Buick might tool into a station, where he stops for a

• CONTINUED ON PAGE 220

Pipe Line Men in the News

Indiana Standard Man Heads PAD Supply and Transport

R. E. Nelson, Jr., of Standard Oil Company (Indiana) on February 1, 1953, will join Petroleum Administration for Defense in Washington, D. C., as director of the supply and transportation division. He will be granted a leave from his duties as Standard's general manager of crude oil supply and products pipe lines.

R. E. Nelson, Jr.

At PAD Nelson will succeed C. E. Spahr, vice president of the Standard Oil Company (Ohio).

Nelson was employed by the Dixie Oil Company in 1929 as a geological scout in West Texas. Later he joined Stanolind Oil and Gas Company of Tulsa, where he served as district landman, assistant division landman, unitization superintendent, executive assistant to the director of producing and manufacturing, and division manager. As division manager for Stanolind at Houston, he had charge of exploration, drilling, and producing activities of that company in the Texas and Louisiana Gulf Coast, including all offshore operations.

He was assistant to the president of Service Pipe Line Company at Tulsa when he was appointed general manager of crude oil supply and product pipe lines for Standard of Indiana at Chicago in 1950.

Nelson is also president of the Wyco Pipe Line Company.

Magnolia Pipe Line Shifts Superintendents, Engineers

E. J. Wacker, who has been acting division superintendent of Magnolia Pipe Line Company's Southern division with headquarters in Houston, has been made an assistant chief mechanical engineer and transferred to the Company's general offices in Dallas.

J. R. Wright, district superintendent of Magnolia Pipe Line Company's Houston and Beaumont districts with headquarters in Houston, has been promoted to assistant superintendent of the company's Southern division with headquarters at Houston.

L. J. White, formerly assistant district superintendent of the Dallas Pipe Line district with headquarters at Corsicana, Texas, has been promoted to district superintendent of the Houston and Beaumont district with headquarters at Beaumont.

M. R. Anderson, who has been chief engineer at the Hebert Station near Beaumont, has been made assistant district superintendent of the Dallas Pipe Line district with headquarters at Corsicana. Wayne Harris, formerly assistant chief engineer at Corsicana, has been made chief engineer at Hebert Station.

Carefully Engineered Lines Guarantee Service—Owens

Modern pipe line companies, especially designed for transmitting natural gas over long distances, have achieved a record of practically 100 percent continuity of service, and have reduced to a minimum the possibility of breakdowns, Stanley Owens, director of safety of Transcontinental Gas Pipe Line Corporation, told members of the New York Mariners Club at a dinner meeting.

He traced the safety features that go into modern lines, from fabrication of the pipe, through the construction period to maintenance during actual operation.

He pointed out that Transcontinental, which supplies New York City with natural gas, from the beginning of operations, has not met with a single accident involving injury to the public or damage to public property.

Service Pipeliner Elected By Public Relations Society

Richard W. Ellison, manager of industrial relations for Service Pipe Line Company, Tulsa, was elected to the board of directors of the Public Relations Society of America at its fifth annual conference in Washington, D.C. He is the official chapter representative for the Tulsa area and joins a board consisting of 24 representatives of chapters of the society from Boston to Hawaii. Ellison becomes one of the society's 13 directors and was honored because of his outstanding work in the field of industrial relations.

R. W. Ellison

Bishop Joins C.R.C. Company As Executive Administrator

E. D. (Chuck) Bishop has joined C.R.C. Engineering Company, Houston, in an executive position as director of purchases, and will also be directly in charge of the administrative division of the company.

E. D. Bishop

Bishop will direct purchases of approximately $150 million for the company's contract with U. S. Pipe Line Company for design, engineering and supervision of construction for the products pipe line which will extend from Gulf Coast refineries to East Coast markets. He will also direct purchases for several other projects which the company now has under way.

A native Texan and graduate of Baylor University, Bishop was formerly vice president and general manager of Alexander Motor Company in Dallas.

Service Promotes H. A. Davis To Illinois Area Coordinator

Harold A. Davis, Galesburg, Ill., material and time supervisor for Service Pipe Line Company's Illinois division, has been promoted to area coordinator.

In his new capacity Davis will supervise clerical procedures of field activities of the company's Illinois division. Service Pipe Line transports crude oil from southwestern and Rocky Mountain oil producing states to Chicago area refineries through a multiline system that crosses Illinois.

Veteran Pipeliner Retires

After almost 38 years of service, W. M. Steele, station chief engineer at Oxford Station, Louisiana, for Interstate Oil Pipe Line Company, has retired. A major part of his service with the company was in the position of station chief engineer. Working and living in Oxford where he was born and raised, he devoted 37 years and almost eight months, to his company. Shortly after retirement Steele saw the crew of his station win an API safety award for having worked 500,000 man hours without a lost time industrial injury.

FOUR PIPELINERS who attended a recent WORLD OIL conference and deer hunt are shown here in Publisher Ray L. Dudley's ranch home near Uvalde, Texas. Left to right are E. Clyde McGraw, vice president of Transcontinental Gas Pipe Line Company; S. C. Kershner, vice president of The Texas Pipe Line Company; A. H. Newberg, chief engineer for Service Pipe Line Company; and A. C. Golden, Jr., manager of Pan American Gas Company.

Companies' Committee Elects Interstate Man as Chairman

The Committee for Pipe Line Companies, composed of crude oil and products pipe line carriers in the U. S., elected the following officers: Joseph L. Seger, Interstate Pipe Line Company, Shreveport, chairman; L. H. True, Magnolia Pipe Line Company, Dallas, vice chairman; Paul J. Bond, The Pure Oil Company, Chicago, treasurer.

Gordon C. Locke, Washington, D. C., was re-elected executive secretary and associate counsel, and Fayette B. Dow, also of Washington, was re-elected general counsel.

The newly elected officers will serve during the calendar year 1953.

Briefs on Pipeliners . . .

Harry R. Marsh has resigned as resident manager and chief engineer for the J. B. Gill Company, Tulsa, and has opened a consulting office, specializing in matters pertaining to pipe line compressor and pump stations and gasoline plants.

•

W. C. Cooper, engineer of Service Pipe Line Company in the Missouri division, has been assigned temporarily to the engineering department in Tulsa. An Ordnance reserve captain he returned to the company after serving ten months as engineer field maintenance officer at Camp Atterbury, Ind.

•

Walter I. Clark, pipe line engineer in Texas for Sinclair Pipe Line Company with headquarters at Fort Worth, has retired. He became a pipeliner in 1913, and was with Prairie Pipe Line Company at Independence, Kansas, before being transferred to Texas in 1918. He was with Prairie at Eastland at the time Prairie was merged into the Sinclair interests.

•

B. M. Moroney has been appointed assistant manager of Canadian Gulf Pipe Line Company with headquarters at Edmonton, Canada.

•

J. E. Mims, formerly acting superintendent of the Ozark division, Shell Pipe Line Company at Springfield, Mo., has been transferred to Austin, Texas, as division superintendent of the Rancho pipe line system. He is succeeded at Springfield by **C. P. Wilson,** former Bayou division superintendent at Port Neches, Texas, who returned recently from Venezuela.

•

C. M. Collins, chief engineer of the Hydraulics Section and **Sam Lewis,** chief engineer of the Mechanical Engineering department, Williams Brothers Company, Tulsa, pipe line contractors and builders, have been transferred from Atlanta, Ga., and Louisville, Ky., respectively, to Tulsa.

•

Karl T. Feldman who has been acting as chief engineer for the Platte Pipe Line Company has returned to his post as chief engineer of the Sinclair Pipe Line Company at Independence, Kansas. While with the Platte during its construction period in 1951-52, Feldman's duties were handled by **Earl W. Unruh.**

H. H. Anderson

■ CONTINUED FROM PAGE 218

chat with the operator. Even on hurried trips he seldom passes a crew headquarters without looking in.

His visit over, he's gone, flying low.

"Does Mr. Anderson always drive in a hurry?" an associate was asked.

"I couldn't say," was the solemn reply. "I only flew with him once. That was the day I decided a DC-6 was more comfortable off the ground than a Buick."

He lunges into his vacations with the same grim gusto with which he tackles his work. Each Christmas he besieges the fish at Lake Okeechobee, Florida. Probably he catches fish, but nobody admits hearing him say so. Perhaps his love for the truth dulls his accomplishments.

Other than the promotion of engineers in the esteem of managers, and vice versa, he has few interests not directly related to work. He avoids clubs of vague purpose. Exercise he has not time for, though he keeps in shape, prides himself on holding his 6-foot, 3-inch frame to 210 pounds. He likes a brisk rubdown, and the first question he may ask when arriving in a town new to him is: "Know of any osteopaths here?"

Vigorous and enthusiastic, Anderson is entering his new career at the height of his usefulness. And still another challenge awaits the completion of his service with Trans Mountain, which reserves permanent positions for Canadians. He has not divulged his plans, but friends guess he may go into consulting work. Said one: "Whatever it is, you can bet Hal will be doing something—and damn well, too!"

. . . Milestones

Born in Portland, Oregon. B.S. in electrical engineering from University of Southern California, 1941, and a master's in physics and mathematics in 1916. Joined Shell as field engineer in Coalinga fields, California. Became chief engineer of Shell's Production department on West Coast in 1925. Six years later moved to New York as assistant to president of Shell Union. After another move, to St. Louis, in 1932 was made a vice president of Shell Oil and was later in charge of Transportation and Supplies department and then Personnel and Public Relations department. Moved to Shell Pipe Line in June, 1941, as vice president and general manager.

PIPE LINE *Construction*

By **MARION DENNARD,** WORLD OIL Staff

Completed Platte Pipe Line Carries Crude from Rockies

Platte Pipe Line Company has placed in full operation its 1056-mile common carrier crude line which stretches from the Big Horn Basin of northern Wyoming across Nebraska, northeastern Kansas and Missouri and terminates at Wood River, Ill.

At Salisbury, Mo., and Wood River the line connects with others which can carry the oil to the principal refining centers in the Great Lakes area and farther east.

The line can carry 100,000 barrels per day and will handle three grades of oil by batching operations. One stream will be low gravity sour crude produced mainly in the Big Horn and Wind River basins. The sweet crude stream will originate principally in the fields of eastern Wyoming and of the Denver-Julesburg basin of Colorado and Nebraska. In addition, a third stream will be provided for those crudes which have a sulfur content above the maximum permitted in the sweet stream but which are free of hydrogen sulfide.

Algonquin's Future Doubtful As System Nears Completion

As another segment of its New England pipe line was completed, Algonquin Gas Transmission Company was still involved in proceedings with the Federal Power Commission to determine whether it could begin natural gas service to markets in the East.

The portion completed by Williams Brothers Company, Tulsa, consists of 143 miles of 26-inch gas line from Morristown, N. J., to Waterbury, Conn., with approximately 25 miles in the Boston-Cambridge area.

After dismissing Algonquin's application for a temporary certificate authorizing operation of its system, FPC reconsidered and reopened hearings. The earlier order dismissing Algonquin's application was affirmed. The future of the extensive system was left uncertain by this latest move in a series of actions and reversals during the past two years.

Construction of Algonquin's system, now virtually complete, was started in 1951 after the company received FPC approval to build a line to serve Connecticut, Massachusetts, Rhode Island and New Jersey markets. On appeal by Northeastern Gas Transmission Company, a competitor for the market, the order was later set aside by the U. S. Court of Appeals for the Third Circuit.

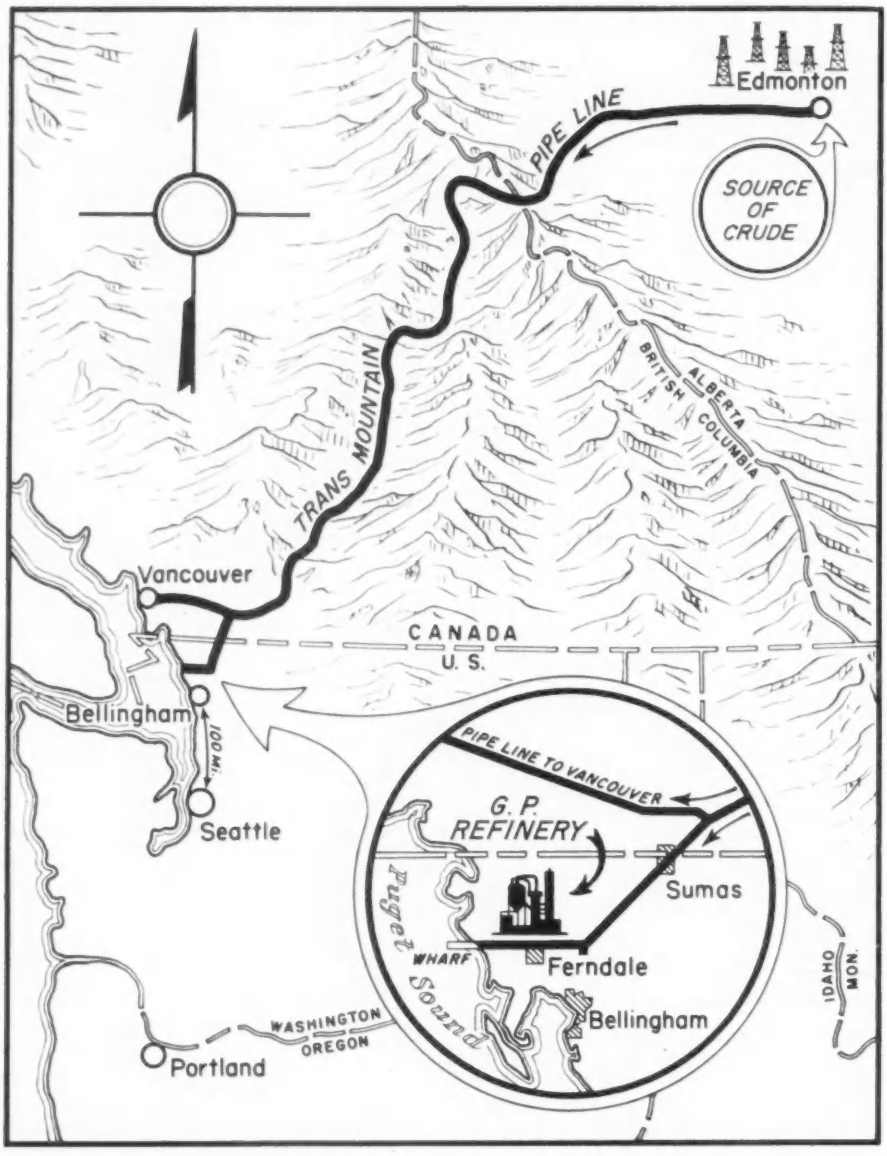
Half-Million Tons of Pipe Allocated in First Quarter

U.S. pipe line construction projects have been allocated 490,853 tons of pipe for the first quarter by Petroleum Administration for Defense.

Six large crude lines and eight large products lines have been given PAD priorities assistance for purchase of 222,896 tons of line pipe, and a number of smaller oil projects have been given priorities aid to buy 11,457 tons.

Natural gas pipe line and underground storage projects have been awarded total primary pipe allocations of 256,500 tons for use in construction in the first quarter. The allocation was divided 140,100 tons of pipe for eight major projects, and the remaining 116,400 tons for 450 smaller jobs, including gathering and distribution lines, and other facilities.

"TURNING ON THE GAS" through Transcontinental Gas Pipe Line Corporation's new crossing under the Narrows of New York Harbor, left to right: E. Clyde McGraw, vice president of operations, Transco; Claude A. Williams, Transco president; Dominick Paduano, Commissioner of Water Supply, Gas and Electricity of the City of New York; and Victor Gallucci, president, Samuel Gallucci & Sons, Inc., prime contractors for Transco in its Narrows Crossing.



Map of the Trans Mountain line and the proposed extension to serve new refinery at Ferndale.

Trans Mountain Plans Extension into U. S.

Trans Mountain Oil Pipe Line Company has announced it plans to build a pipe line extension from its main trunkline connecting Alberta oil fields with the Pacific Coast across the Canadian-U. S. border in a southerly direction toward Seattle.

And General Petroleum Corporation has announced it plans to erect immediately a 35,000-barrel-a-day, $35 million refinery at Ferndale, north of Bellingham, Wash. This first modern full-scale oil refinery in the Pacific Northwest will process Canadian crude transported through the Trans Mountain extension by a lateral to the Ferndale refinery.

The pipe line extension and lateral will cost an additional $2¾ million and will be built by Trans Mountain in 1953 so as to be ready for the completion of the new refinery in 1954.

Nearly half of the Trans Mountain pipe line between Vancouver and Edmonton is now in the ground and the company has commenced a training program for the crews which will operate the line on completion.

Canadian Bechtel Limited, agents for the owner corporation, announced that 325 miles of pipe line have been laid. Crews slowed down operations at the end of November as welding could not be efficiently carried out in cold or rain. The remaining 386 miles will be constructed in the spring and should be finished by August, 1953. Oil is expected to be pumped into the line in October.

Inside work will be continued on pumping stations during the winter months.

Men to be used in the operating crews are now undergoing a six-week training course in the U. S. They will spend 2½ weeks in the St. Louis manufacturing plant where the 1800-horsepower diesel engines for the pump stations are being manufactured; an equal period at the tank farm and pump station of Ozark Pipe Line System at Cushing, Okla.; a week at Portland, Ore., where the large centrifugal pumps for the Trans Mountain stations are being manufactured.

Interprovincial Proposes Superior-Sarnia Extension

Eastern Canada's dependence on imported petroleum from the U. S. and Venezuela will be substantially reduced with the proposed crude oil line extending the present Interprovincial Pipe Line System from Superior, Wis., to the Sarnia, Ont., refining center.

The proposed extension would be a 625-mile, 30-inch diameter line across northern Wisconsin and Michigan to the Mackinac Straits and then southward through Michigan to a crossing on the St. Clair River near Sarnia. Initial capacity would be 85,000 barrels daily, approximately equal to the present refinery capacity in the Sarnia area, though additional pumping stations could be added to boost the line's capacity to more than 300,000 barrels per day.

Petroleum Administration for Defense announced in December it had approved construction of the proposed line and had made advance allocations of line pipe totaling 160,000 tons for possible completion by next fall. PAD allocated 45,000 tons for immediate use in commencing the line. T. S. Johnston, president of Interprovincial Pipe Line Company, said the decision to proceed with the project will depend entirely upon satisfactory financing arrangements.

Completion of the proposed Superior to Sarnia extension would increase the Interprovincial System, which starts northeast of Edmonton, Alta., to a total distance of 1750 miles and would require another enlargement of the line's capacity into Superior. The present Interprovincial Line has a capacity for 61,000 barrels daily.

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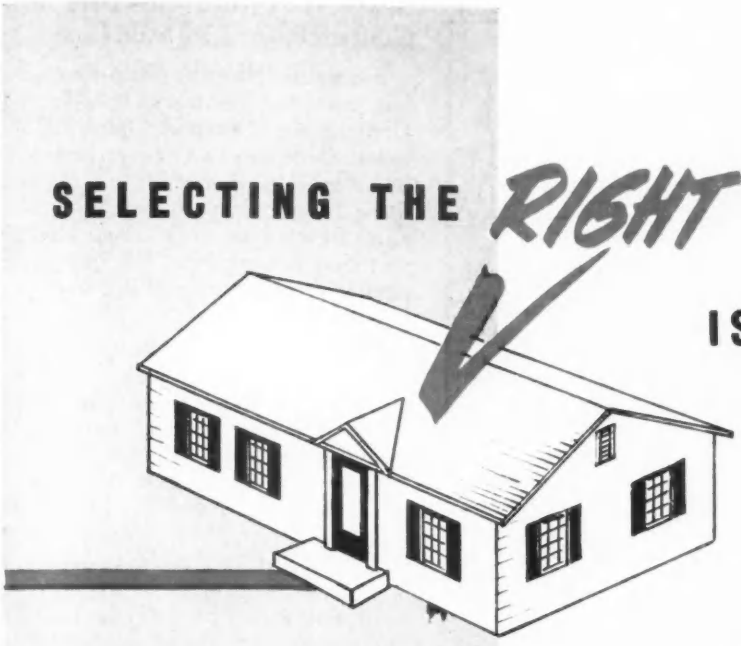

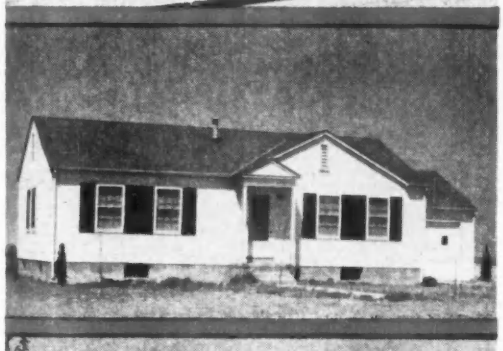

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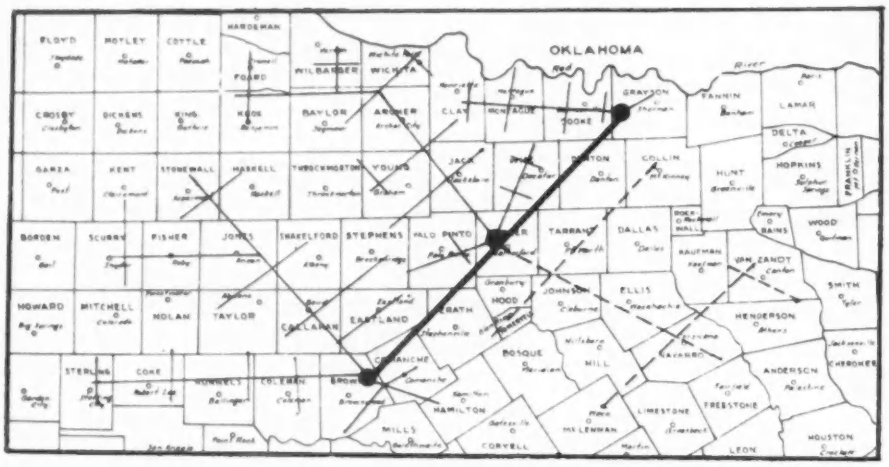

Map of proposed Fort Worth Basin System.

Fort Worth System Is Planned

The Fort Worth Basin Gas Company, organized by O. R. Smith and Associates of Fort Worth, has proposed building a gas gathering system with main line extending from near Brownwood, Brown County, Texas, into Grayson County, Texas. The system will gather gas from fields in Grayson, Cooke, Denton, Wise, Montague, Clay, Wichita, Wilbarger, Baylor, Archer Throckmorton, Young, Jack, Parker, Palo Pinto, Stephens, Shackelford, Haskell, Stonewall, Fisher, Jones, Taylor, Callahan, Eastland, Erath, Comanche, Brown, Coleman, Runnels, Coke, Tom Green and Concho counties. Gas will also be gathered and processed from adjoining counties where gas reserves warrant.

Gasoline plants will constitute part of this large gathering system with three initial plants located in Brown, Parker and Grayson counties. This system is planned for a wholesale distribution of gas and gas products to gas distributing systems on a nationwide scale.

The system will be owned and financed as a cooperative organization of independent oil operators and eastern finance companies. The major portion of the capital will be furnished by Texas interests.

The new company is a corporation with O. R. Smith as president and M. M. Donaho as vice president and when in operation will be one of the largest gas and gas products systems in the Southwest.

Lone Star Completes Line

The Lone Star Gas Company is completing its new 70-mile, 20-inch natural gas transmission line from the Golden Trend area of Garvin County in Southern Oklahoma, to Petrolia, in Clay County, North Texas.

The new line will tie into Lone Star's main North Texas transmission system. The artery will traverse Stephens, Jefferson and Cotton counties in southern Oklahoma and offer gas producers an outlet. It will cross the Red River on a new bridge and give Clay County an additional outlet for gas.

El Paso Proposes Gas Line To Serve Salt Lake City

A 96-mile, natural gas transmission system from Clear Creek, in Carbon County, east central Utah, to Salt Lake City is proposed by El Paso Natural Gas Company and Utah Natural Gas Company. El Paso recently purchased controlling interest in the Utah firm.

The new line would be an 18-inch installation from Clear Creek to Provo, Utah, and 16-inch from Provo to Salt Lake City. It would have an initial daily capacity of 50 MMcf, with provisions to increase the maximum to 150 MMcf. Anticipated completion date is December 1, 1953.

El Paso has also started construction of 200 miles of 4- through 24-inch gathering system near Midland, Texas, and 47 miles of 26-inch line in the Ehrensburg, Ariz., area. When the Arizona section is completed, the company will start work on 54 miles of 30-inch loop line in the San Juan area of New Mexico.

Southern Natural Gas Lets Contracts for 834-Mile Line

Southern Natural Gas Company has awarded contracts to Houston Contracting Company and H. C. Price Company for construction of 833.4 miles of loop and new gas pipe lines, 14- through 24-inch, in Louisiana, Mississippi, Alabama, Georgia and South Carolina. The job is expected to be completed in December, 1953.

The company has received FPC authorization to construct pipe line facilities estimated to cost about $32½ million to bring natural gas from 12 fields in southern Louisiana and southern Mississippi. Included are more than 326 miles of pipe line and approximately 8700 horsepower in compressor capacity. These additions are part of a project proposed by Southern to increase the daily delivery capacity of its pipe line system from 670 million cubic feet to 1020 million cubic feet.

FPC-authorized projects include (1) a 67.8-mile, 24-inch line extending southerly from the company's Gwinville, Miss., compressor station to Franklinton Junction, La., together with a 19-mile, 8-inch lateral line extending easterly to the Sandy Hook field, Miss.; (2) 109.5 miles of 20-inch line extending southwesterly from Franklinton Junction to the Duck Lake gas field, La., thence 12.7 miles of 10-inch pipe line to the Lake Sand field, Louisiana; (3) 117.6 miles of 20-inch line extending southeasterly from Franklinton Junction to a point in Plaquemines Parish, La., together with lateral lines to various fields in Louisiana; (4) a new 3300 horsepower compressor station on the 117.6-mile line; and (5) additions of 5400 horsepower at the company's Gwinville station.

East Tennessee Receives FPC Okay for Extension

East Tennessee Natural Gas Company, Knoxville, Tenn., has received FPC authorization to construct a 100-mile extension of its 16-inch natural gas transmission system, from a point near Knoxville to the Kingsport, Tenn., area, together with approximately 58 miles of various sized lateral lines.

The project, estimated to cost about $5.8 million, will provide natural gas service to Morristown, Johnson City, Elizabethton, Bristol, Greeneville and Kingsport, all in Tennessee.

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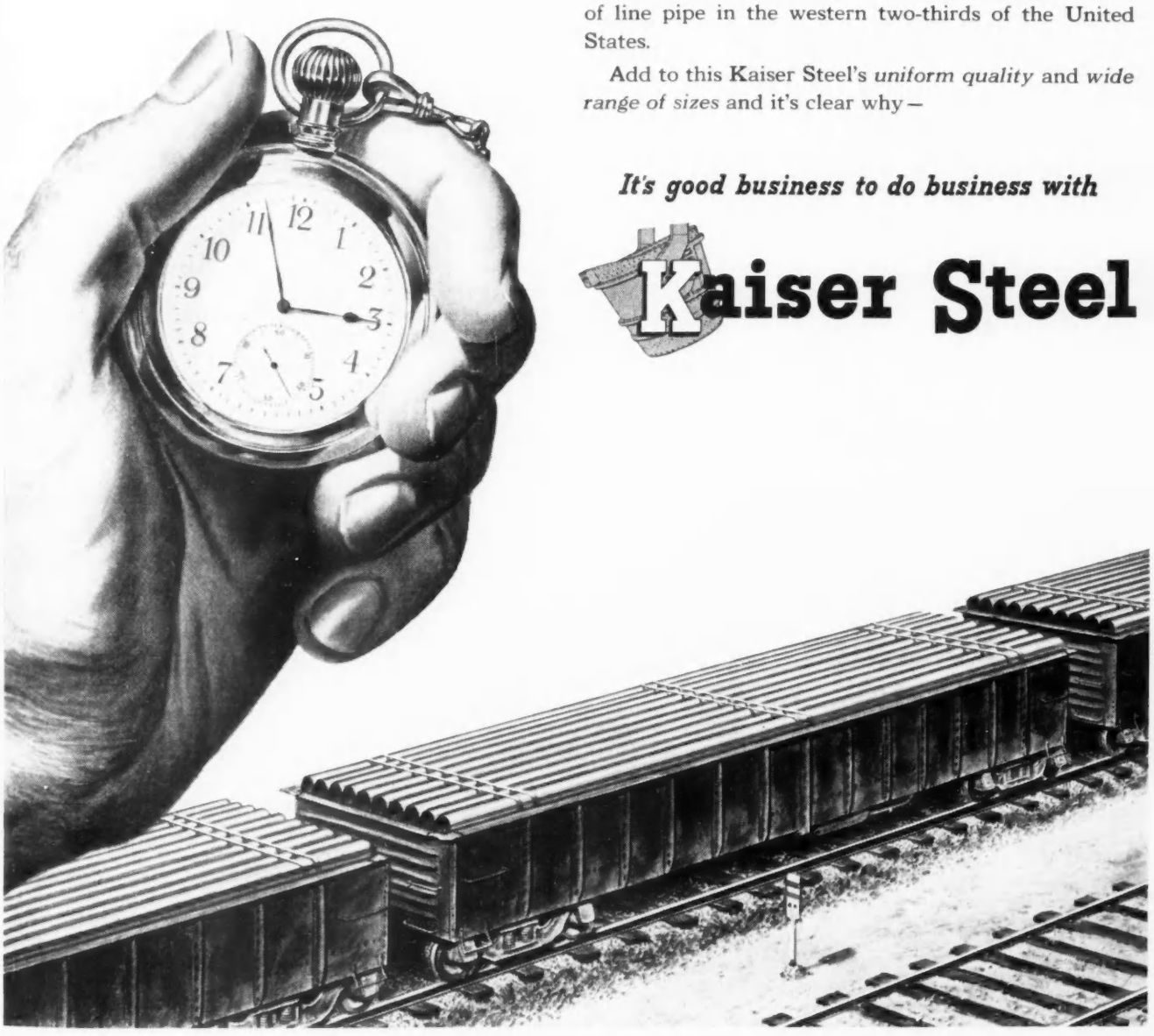

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Continuous Weld—Plain End	2⅜" to 4½" O.D.	Up to 40'	Standard	Fontana, Calif.
Electric Resistance and Fusion Weld—Plain End	8⅝" to 20" O.D.	Up to 40'	.188" to .500"	Napa, Calif.—Basalt-Kaiser
Electric Resistance Weld—Plain End	5⅝" to 12¾" O.D.	Up to 55'	.188" to .375"	Fontana, Calif.
Electric Fusion Weld—Expanded—Plain End	22" to 30" O.D.	Up to 40'	.188" to .500"	Napa, Calif.—Basalt-Kaiser

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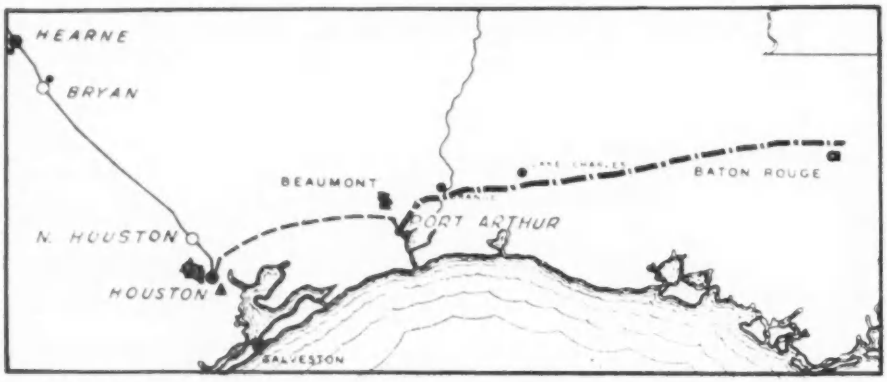


ROUTE OF SINCLAIR'S 85-mile Houston to Port Arthur products line is indicated by dashed line. Also shown is the route of the Evangeline Products System from Port Arthur, 196 miles of 16-inch line.

Sinclair Starts Work on New 85-Mile Texas Products Line

Construction has begun on the first section of a 12-inch products pipe line of Sinclair Pipe Line Company, to run 85 miles from Sinclair's Houston refinery to Port Arthur, Texas. The first section will comprise 40 miles of line.

The line will have daily capacity of 54,000 barrels, and will connect near Port Arthur with the 16-inch Evangeline line now under construction between Port Arthur and Baton Rouge.

Estimated to cost $3 million, the new Sinclair products line will be completed March 31, 1953.

Illinois Line Completed

Shell Oil Company is completing three sections of its Wood River, Ill., to East Chicago, Inc., products pipe line project. Mary Construction Company, Cape Girardeau, Mo., finished 51 miles of 14-inch lay and 8-inch takeup, and P. & S. Constructors, Inc., built 276 miles of 14-inch. R. B. Potashnick, Cape Girardeau, was contractor for 280 miles of 14-inch, and 320 miles of 8-inch takeup.

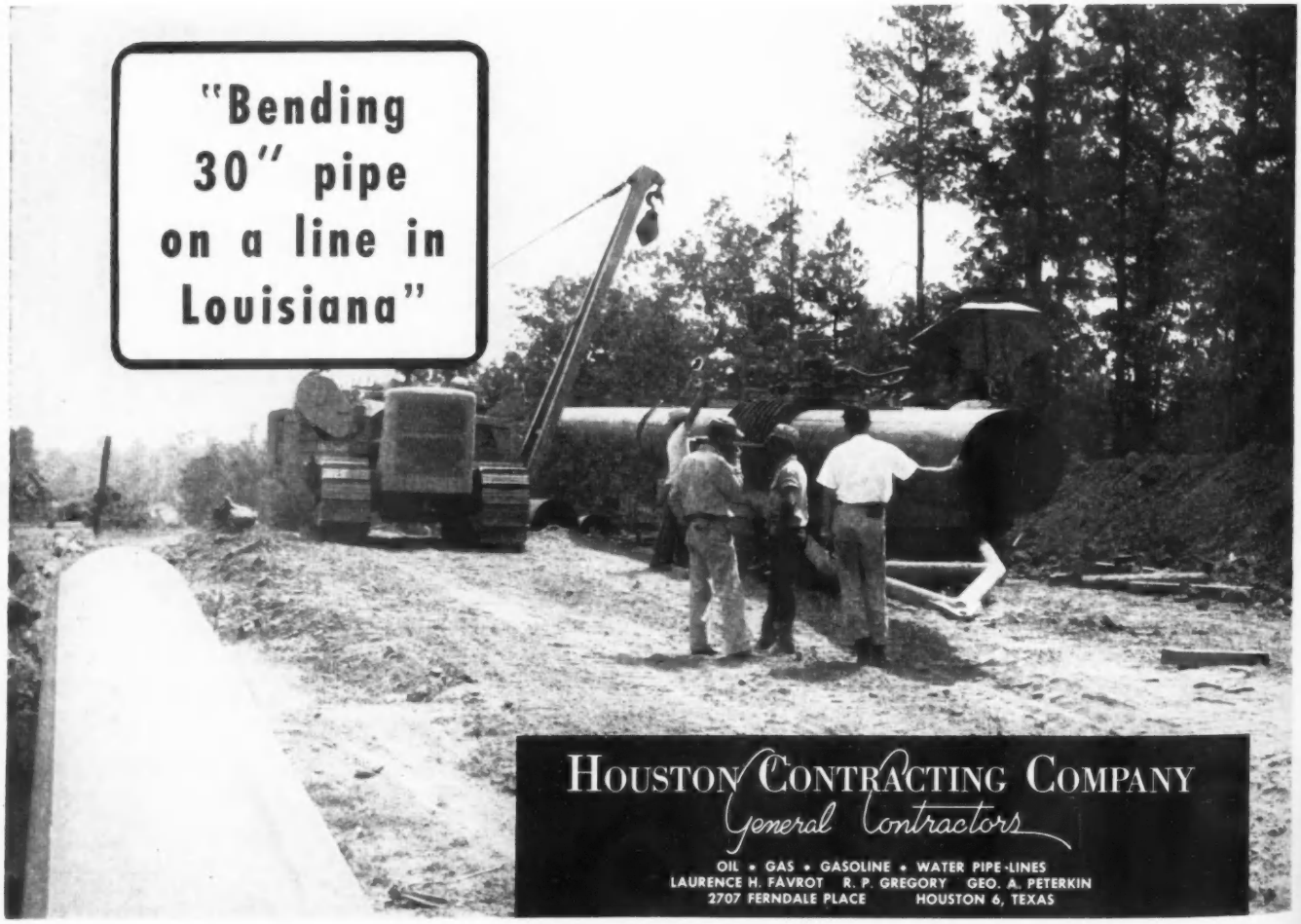
Cities Service Gets Pipe For Texas-Louisiana Lines

Cities Service Pipe Line Company has received delivery on 65 miles of 20-inch pipe destined for its new line between Sour Lake and Lake Charles, La. At the same time the company announced that right-of-way is cleared, pipe has been strung and 30 percent of the line has been welded, primed and doped on the 18-mile line that will parallel the Coates-Cimarron system.

At Pampa, Texas, washing is continuing on a cavern for the storage of LP-gas. Eventual capacity will be 4 million gallons. Plans for another underground storage project near Hutchinson, Kansas, are being completed. This project will also have an eventual storage capacity of 4 million gallons of LP-gas.

All of the approximately 112 miles of 20-inch pipe that will form the leg from Wortham to Longview, Texas, has been received and more than 83 miles has been laid.

Work on pump stations and tank farms on the newly-completed Mesa pipe line is progressing. This 24-inch system extends from Midland, West Texas, to Colorado City. At Colorado City this line ties into the West Texas-Gulf system.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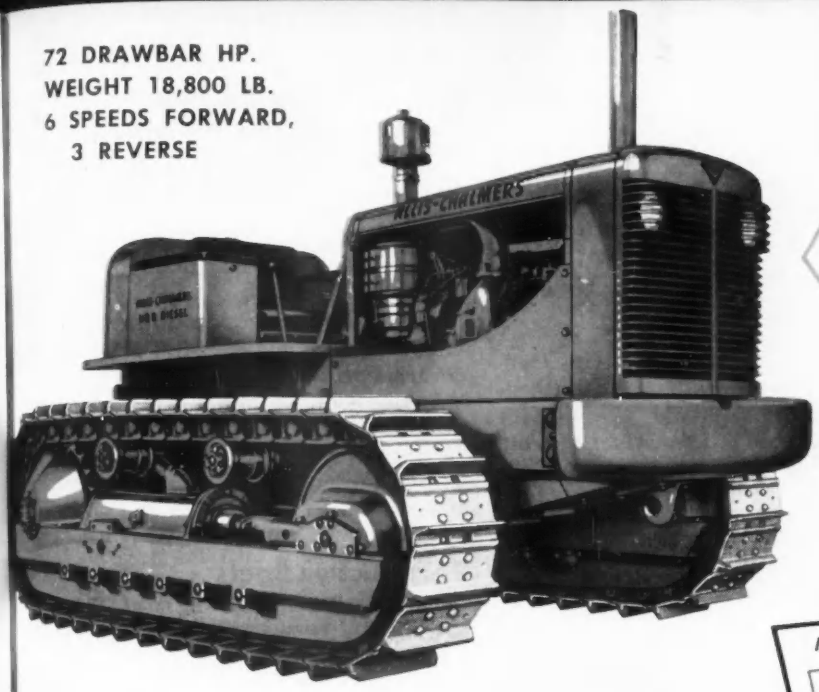

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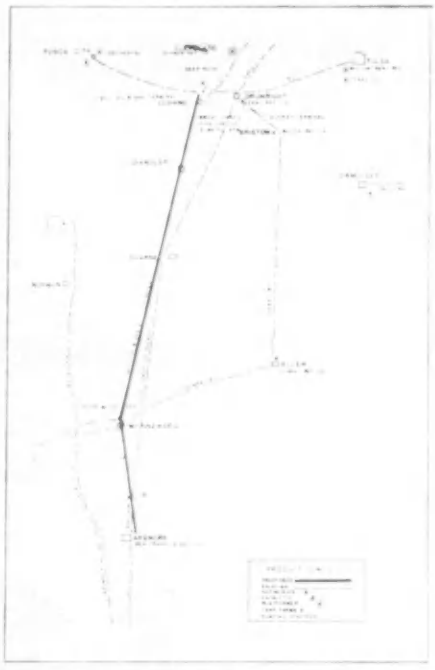

Proposed products line of Bell Oil & Gas Company, from Ardmore to Cushing, Okla.

Bell Line Will Transport Products to Northern Area

Bell Oil and Gas Company, Tulsa, plans to construct 145.6 miles of six-inch products pipe line from its Ben Franklin refinery at Ardmore to Cushing, Okla. There the line will tie into the Great Lakes Pipe Line Company system, moving the products for distribution in Bell's northern markets. The project will cost approximately $3 million.

One or more booster stations are contemplated, with Wynnewood, Okla., as location for at least one of the stations. No contract has been let but construction is expected to get started early in 1953 with the line in full operation later in the year.

FPC Gives Go-Ahead for New Gas Line in Pennsylvania

New York State Natural Gas Corporation, New York, has been authorized by FPC to build 20 miles of natural gas line in Pennsylvania, from an existing system connection in Clinton County to the Driftwood gas field in Cameron County. In addition the company will build 970 feet of 20-inch pipe line in Tioga County, Pa., connecting its Sabinsville compressor station with existing transmission lines.

FPC has not acted on a request to construct 75 miles of 20-inch line, a proposed extension from the 20-mile line to a connection with New York State Natural's main dual line transmission system in Armstrong County.

Missouri Line Canceled

Associated Natural Gas Company, Tulsa, has withdrawn its FPC application to build natural gas pipe line facilities in eastern Missouri. Plans were canceled, the company said, because the company was unable to get firm commitments for an adequate supply of gas. The proposed 32 miles of line would have served Jackson, Portageville, Gideon, Morley, Spoonerville and Bernie.

Indiana Standard Line Set

Work has started on 306 miles of 12-inch products line from the Sugar Creek, Mo., refinery of Standard Oil Company (Indiana) to Dubuque, Iowa, where it will connect with the existing Whiting, Ind., to Moorhead, Minn., line.

The 120-mile section from Sugar Creek to Unionville, Mo., is under contract to Sheehan Pipe Line Construction Company, Tulsa, while the remaining 186 miles from Unionville to Dubuque are being handled by O. R. Burden Construction Corporation, Tulsa.

Construction Briefs . . .

Buffalo Oil Company will soon put into operation in Okfuskee and Hughes counties, Oklahoma, ten miles of 8-, 10- and 12-inch crude line which is being completed by Gustine & Walden Company, Dallas.

•

FPC has authorized **Cities Service Gas Company** to install 11,400 horsepower at one existing and one new compressor station in Kansas. Three 1600-hp units will be built at the Greensburg station in Kiowa County, and six 1100-hp units in a new station in Harvey County.

•

Colorado Interstate Gas Company is adding 35 miles of 6- through 12-inch natural gas line to its system near Lakin, Kansas. Engineering Construction Company, Tulsa, has started work on the project.

•

Cumberland and Allegheny Gas Company completed in December 17 miles of 12-inch natural gas line from Keyser, W. Va., to Cumberland, Md. Britton Contracting Company, Inc., Washington, Pa., was contractor.

•

Derby Oil Company is completing 22 miles of 4-inch takeup and reconditioning from Burrton to McPherson, Kansas. Mitchell Construction Company, Wichita, Kansas, is doing the work.

•

Gulf Oil Corporation has awarded contract to George Tucker Pipe Line Construction, Odessa, Texas, for 32 miles of 18-inch pipe line to carry crude from Wink to Goldsmith, Texas.

•

Gulf Refining Company now has under construction 22 miles of 10-inch crude line from Wortham to Corsicana, Texas. The work is being done by Anderson Brothers Corporation, Houston, which also has contract with Gulf Refining for 47 miles of 10-inch line from Midland to Goldsmith field, near Notrees, Texas. Work will begin on this line when the 22-mile line is completed.

•

George Tucker Pipe Line Construction, Odessa, Texas, is building 8 miles of 8-inch crude line near Odessa for **Humble Pipe Line Company.**

•

Interstate Natural Gas Company, Inc., has awarded contract to L. E. Farley, Inc., Houston, for construction of 64 miles of 16-inch gas pipe line from Bateman Lake near Morgan City, La., to Baton Rouge, La. Stringing will start in January.

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Britton Contracting Company, Inc., is completing 15 miles of 12-inch natural gas line near Claysville, Penn., for **The Manufacturers Light and Heat Company.**

•

MidSouth Gas Company of Little Rock, Ark., has been authorized by FPC to build a total of 191 miles of natural gas line and to acquire an existing 38-mile line in Arkansas from Arkansas Power & Light Company of Pine Bluff, and the new lateral lines will be used to supply 25 communities with natural gas. Total estimated cost is $4.5 million.

•

Natural Gas Storage Company has completed 20 miles of 12-, 20- and 30-inch natural gas lines from Dwight to Herscher, Ill. Say L. Smith & Son, Inc., El Dorado, Kansas, was contractor.

•

New York State Natural Gas Corporation had scheduled for completion in December 29 miles of 20-inch natural gas line from Tonkin Station to Kittaning, Penn. Williams-Austin Company, Pittsburgh, was builder.

•

Reese Brothers Construction Company, Hugoton, Kansas, has resumed work on **Northern Natural Gas Company's** gathering system. The job consists of about 80 miles of 4- through 14-inch lines from Guyman, Okla., to Garden City, Kansas.

•

Pan American Pipe Line Company is building 27 miles of 26-inch crude line from Genoa, where it connects to the Rancho System, to Texas City, Texas. Brown & Root, Inc., is doing the work.

•

Vaughn and Taylor Construction Company, Inc., Wichita Falls, Texas, has started work on 44 miles of 16-inch crude line near San Angelo, Texas, for **Pan American Pipe Line Company.**

•

Southern Union Gas Company has let contract to Foutz & Bursum Construction Company, Farmington, N. M., for 28 miles of 8-, 10- and 12-inch gas lines east of Farmington.

•

H. C. Price Company has completed approximately 363 miles of 26-inch natural gas line from Greenville, Miss., to Louisville, Ky., for **Texas Gas Transmission Corporation.** The line is designed to carry 240 million cubic feet daily to more than 30 distributing utilities.

•

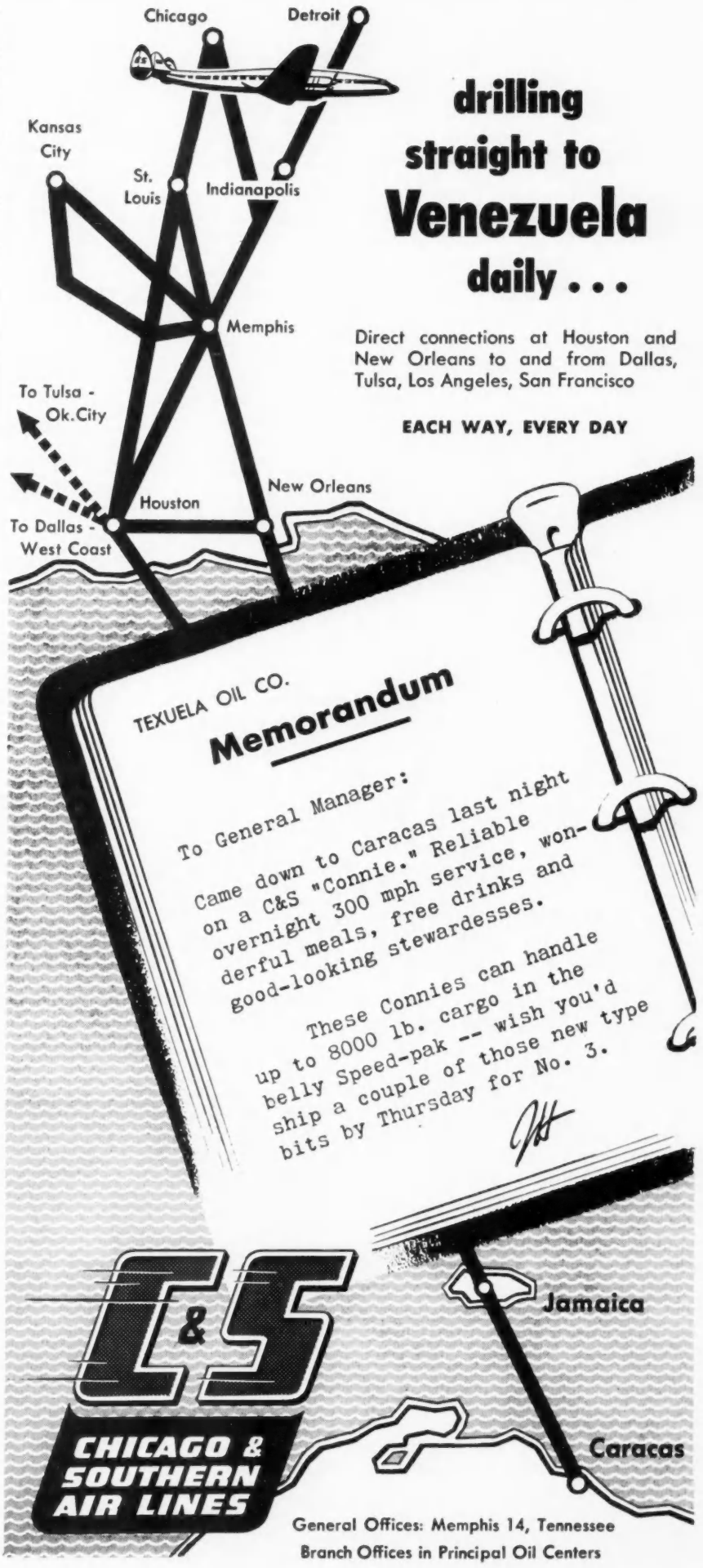
The Texas Pipe Line Company has awarded contract to Holder Construction Company, Snyder, Texas, for construction of a 29-mile, 4½-inch gasoline pipe line in Scurry County, Texas. The line will extend from The Texas Company's Fuller Ranch Gasoline Plant to Basin Pipe Line System's Colorado City, Texas, pump station.

•

FPC has denied application by **United Gas Pipe Line Company** to build about 31 miles of natural gas transmission line from an offshore field in the Gulf of Mexico to a connection with another pipe line now under construction by the company in Terrebonne Parish, Louisiana. The decision stated that natural gas reserves available to the company in the Ship Shoal area are not sufficient to justify the project.

•

Panama-Williams Company, Houston, completed 45 miles of 26-inch crude line from Livingston to Sour Lake, Texas. This was part of the **West Texas Gulf Pipe Line Company** system.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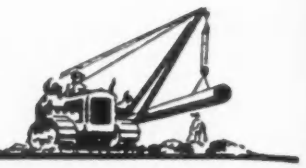

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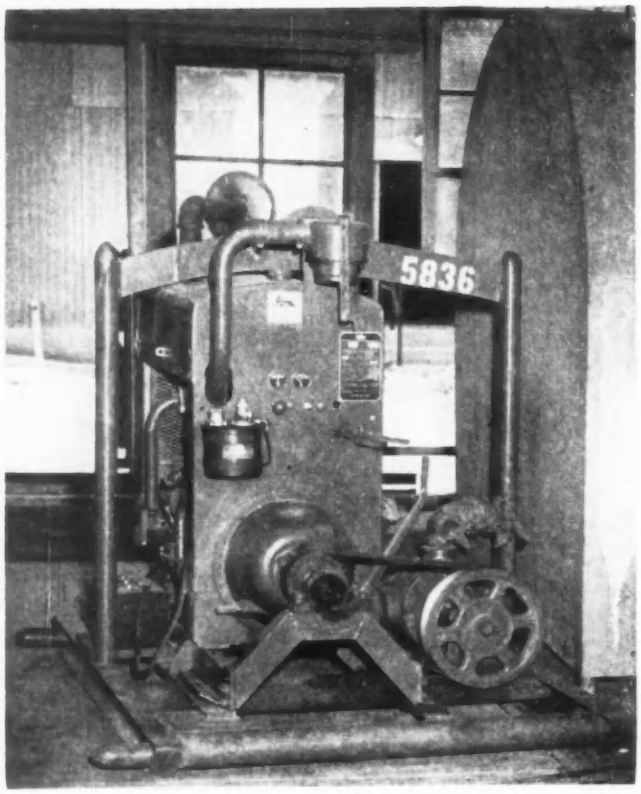
Thousands of dollars in future maintenance can be saved by circulating a flushing oil through an engine for several days before the initial start-up.



By the time any large engine has been erected on its foundation, dust, grit, dirt and lint will have penetrated into its crankcase, oil pump and other parts of the lubricating system. This is the rule; there is seldom an exception. As builders connect the compressor and pump, they open inspection plates, attach compressor rods and make other adjustments. While the engine is open, the dust-laden air of a construction project circulates through the crankcase. Too, the rags used to wipe off parts after they have been adjusted also carry lint and soil inside the engine.

These particles usually find their way into corners and crevices, or circulate through the oil system, to be picked up by the engine oil filter. Unfortunately, the engine must be running for the oil to circulate to the filter. This means that abrasives are carried to engine parts by the oil. In turn, this can cause severe damage and give rise to future maintenance problems and costs.

This initial scoring and wearing can be easily prevented. Just fill the engine with the oil the manufacturer recommends, and circulate it with a temporary gas engine driven pump. The oil will flow through the engine oil system at high velocity, washing dirt and grit out of the engine and into the filters. From time to time, change filter elements and clean strainers.

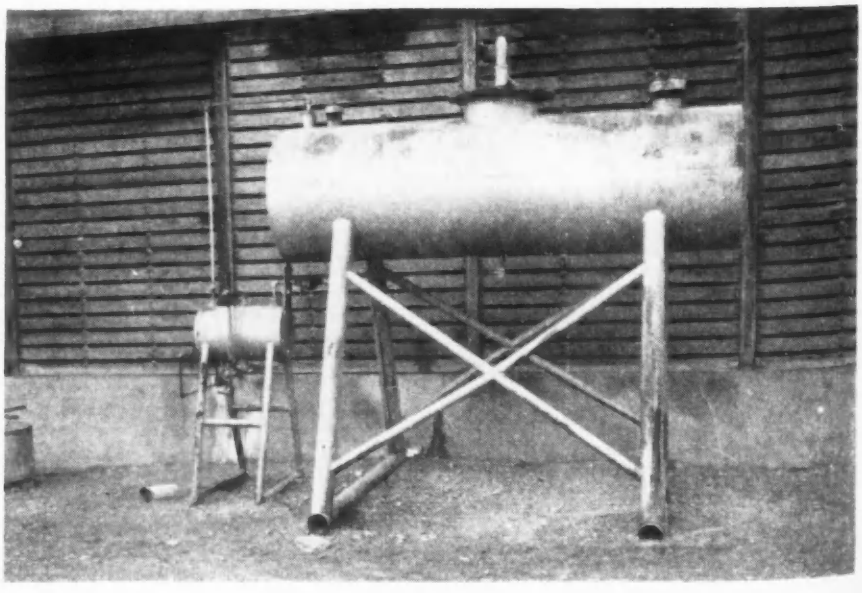
After several days of this operation, when the filters collect no more impurities, drain the oil and start the engine under its own power.

Chemical Treater Is Made of Scrap

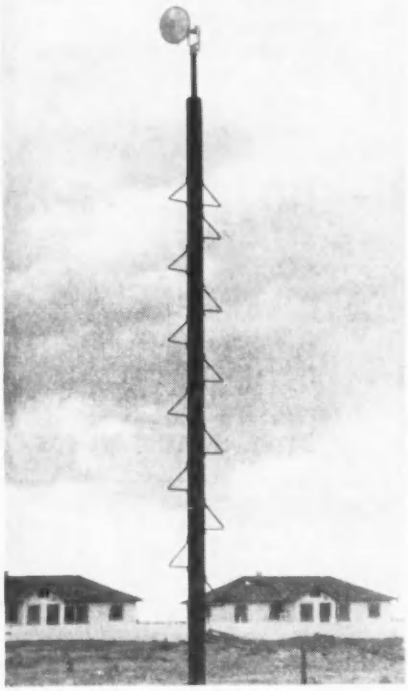
A money-saving idea is to make cooling water chemical treating equipment out of scrap pipe and fittings. The main storage tank, made of 24-inch pipe, can be used for mixing and storing chemicals. The smaller tank, of 10¾-inch pipe, can be used for measuring and feeding these chemicals into the cooling tower basin a few drops at a time, if desired.

Blind off the ends of a six-foot length of 24-inch pipe with quarter-inch steel plate to make the large tank. At the top weld one two-inch and one four-inch threaded nipple. Cap them with screw pipe caps which have handles of reinforcing steel. In the center of the tank, saddle in a piece of 12-inch pipe. Cut a flange to fit it from half-inch steel plate; then cut a blind flange to match from steel plate. Make a stand for the tank out of four-inch pipe with X-braces of 1½-inch pipe.

To make the small tank cut a two-foot length of 10¾-inch pipe and blind off the ends with steel plate. Support it with a steel stand and then pipe it up to the large tank by running a half-inch valved line from the



bottom of the storage tank and an equalizing line to the top of the tank. Install a sight feed glass in the side of the tank for measuring chemicals and then run a half-inch line to the cooling tower. Put a needle valve in this line so the operator can adjust the rate of feed to the tower basin.



Field Forces Can Build Simple Light Standard

Flexible and inexpensive, this station and camp light standard can be made in the field by operating forces.

The body of the standard is made of four-inch pipe with a ladder of rolled mild steel half-inch rod welded to its side. The light fitting at the top of the standard rests on top of the conduit running through the center of the four-inch pipe. This conduit enters the four-inch just above grade, and there are no means of adjusting the light from the ground. However, the ladder permits an operator to adjust the light by turning it to any desired position.

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must in every case include a look at this part of it. Ordinarily, to do this the welding inspector would have to bend over in an awkward and uncomfortable position. The job is made easier by means of a mirror similar to the rear-view mirror which fits on the door of an automobile. A bronze welding rod is brazed to the mirror and bent to suit the inspector. After a little experience, the inspector can judge the weld with the mirror as accurately as with his naked eyes.

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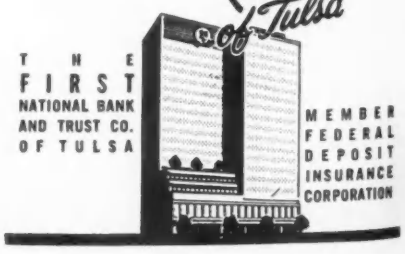

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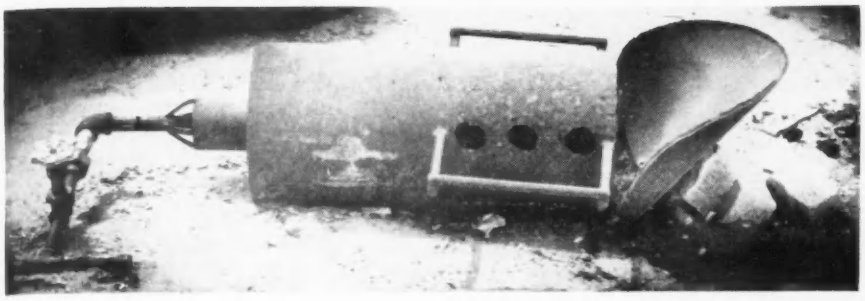
tank clamped to a modified warehouse truck is not only easy to move about the job but also improves paint gun operation by providing a volume chamber near the gun. At the same time the cylinder can be used to carry sufficient air for small paint jobs to save the trouble of moving an air compressor to the location.

When painters work at a distance from the compressors, the pressure drop in the long air hoses makes the paint guns operate inefficiently. This problem is solved by keeping a volume chamber near the work.

Pictured is one company's solution. The tank is made of a short piece of 12-inch type, blinded at both ends with heavy steel plate. There are enough pipe connections to permit it to be hooked up in any desired manner. Clamped to a converted warehouse truck, the tank is easily moved from job to job.



Pipe Heater Has Multitude of Uses

A heater which can be used to heat reinforcing steel, to temper and heat treat steel tools and to aid small pipe fabrication can be made from scrap pipe.

The heater is gas fired, with a half-inch pipe running into the burner. This burner is made of three-inch pipe. It is welded into a steel plate in the end of a three-foot-long piece of 12-inch pipe which is the body of the furnace.

Holes through this pipe and frames on the side permit the rods of pipe or tools to be slipped inside the field furnace to be heated. At one end, the coupon cut from a piece of large diameter pipe can be welded to the 12-inch pipe to deflect the flames upward.

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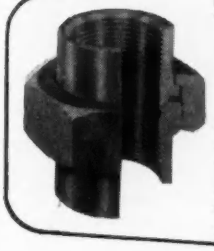

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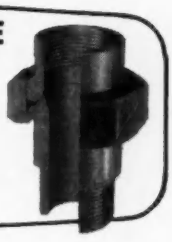

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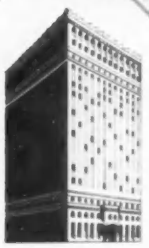

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Global Oil and Trouble Grow Together

How can giant firms dispel erroneous monopolistic and cartel accusations?

By DR. CORNELIUS H. ZONDAG

Editor's Note: This is the first of two articles describing the trials and tribulations of international oil in a changing world—and what can be done to overcome them. Dr. Zondag holds advanced degrees in international law, economics and psychology and has been associated with major U. S. oil companies in foreign operations.

IN THE OLD days finding oil abroad was never easy but at least it was exciting. Opening up a new field is still exciting, except that where you find oil today you may find a substantial package of trouble, too. With a worth in this country alone of almost $40 billion, the petroleum industry, which in 50 years revolutionized the face of the earth, is now faced with billion dollar headaches.

Why is it that an industry having such an incredible record of technical accomplishment is so frequently painted as the villain of modern times? Why is it that an industry that has thrown unprecedented wealth into the lap of so many nations is so bitterly attacked by those same nations? Why is it that an industry whose wartime record has been matched by its rapid adjustment to equally turbulent post-war conditions is so little known to the average citizen?

The answers to these questions are simpler than the solution of the problem itself. They lie both in the essential nature of the industry, dealing with a vital resource which ultimately cannot be replenished, and in the attitudes of oil men.

Until a few years ago, oil men were extremely publicity shy. They had good reasons, for some of them remembered only too well those boisterous early days of the industry when publicity was often equivalent to scandal. After the famous 1911 anti-trust action, the industry quickly learned its lesson. It was satisfied to produce oil, pocket the profits and avoid promotional ballyhoo.

Is it any wonder that the American public and, even more so, foreign public opinion are either ignorant or misinformed about the serious political and socio-economic problems facing the industry today? Is it any wonder that people abroad often tend to look on the oil industry as they mistakenly looked on the munitions industry before 1939?

The time is more than ripe for the entire petroleum industry to go all out and explain and justify its operations and policies, not only to the people at home but especially to the people abroad. As long as the average American keeps believing that we will run out of oil in 20 years, that oil means excessive profits, and that all the big companies are linked in one giant cartel, there is a big job to be done. In the foreign field the surface has not even been scratched.

From an industry point of view, there will always be a certain tragedy in watching an intoxicated, frantic, nationalistic mob gathering before the local head offices of a newly-expropriated oil company, while, in effect this mob was at the very moment being deprived of its livelihood. Likewise, there was a deep tragedy in seeing the Iranian cab driver last fall pull up to the nearest gas station in the honest belief that from then on all gas would be free. In both cases the lack of information is obvious.

It is also high time for oil men to become more alert to the consequences of social change. Too often our oil people working in foreign lands have gone about their business of drilling and extracting oil without contemplating what the native population thought of the foreign companies in their midst or what effects their presence would have on these people.

Our own people have often lacked plain good sense in failing to study what makes the other people tick. They failed to note the unrest and tension all about them, or did little to correct a situation until it was too late. They were frequently caught unawares by the extreme nationalism so rampant in many countries. Yet, this nationalism took a long time in developing its present force.

Dealing with it was not and is not a simple matter. It calls for a skillful psychological approach. We do not always realize that extreme nationalism—which in its simplest definition might be called collective egotism—is compared to the self-assertive, the loud behavior of the neurotic individual who tries to overcome his extreme fear and insecurity by sheer bravado. And many a neurotic is known to have caused even his doctor a good deal of trouble.

It is debatable whether some of the industry's present troubles in the foreign field result from errors of commission or omission, but it certainly is true that some problems might have been handled in a better way had oil men long ago been a little more familiar with sociology and mass psychology. How many American oil company officials abroad know something of the deeper causes of nationalism, group tension, scapegoating and mob behavior?

Many political attacks upon the industry abroad frequently serve no other purpose than to make it a scapegoat for local political or economic difficulties. Yet, how many oil people are aware of the twists and turns of national idiosyncracies, of the basic reasons for feelings of fear and insecurity? On the other hand, they are directly affected by these feelings, for individual insecurity is generally reflected in the choice of those immature and unbalanced leaders who so often cause trouble to the industry or even to nations. It is, indeed, no wonder that a psychopath like Hitler could rise so rapidly in the insecure, neurotic Germany of the 1930's, the same environment which prevented the rise to power of much sounder men.

The petroleum industry is vitally concerned with all this since it has been the vanguard of Western civilization and technology in many underdeveloped countries. Right now, the

oil companies are again severely affected by the changing balance of power resulting from the rapid rise of the downtrodden races of Asia and Africa, where radio and the airplane — to mention but two factors — are changing the outlook of people who ten years ago still would have accepted dying from hunger as a natural thing.

The problems facing the international petroleum industry today are of a wide variety. They range from an ever-growing trend towards nationalization and greater restrictions abroad to increasing government control at home. Almost every day we read in the press about the tidelands issue, some new anti-trust action, cutting the depletion allowance, price control of natural gas, or the government's efforts to get into the synthetic oil business. Many foreign publications bristle with attacks and agitation against the "foreign companies" while ever-changing foreign exchange regulations add to the marketer's daily headaches.

Largely because petroleum has become so vital to all nations of the world the industry is now faced with unique and serious problems. Some of these problems are beyond the scope of the industry to solve by itself. To the solution of others, the industry could make a greater contribution than it is making at the present time. Let us see what could be done by following both a more or less conventional and an unconventional pattern.

What Can Be Done?

As already pointed out, some of the industry's major problems in the foreign field are more psychological and socio-economic than technical. Instead of handling these problems in an old-fashioned, trial and error method, much could be gained by a more scientific approach.

World War II accentuated the need for greater psychological research in industry. When two identical shipyards came up with a radically different production record, it became evident that problems of morale and labor management could no longer be handled on a low priority.

Today, the same scientific approach must be applied abroad. With new evidence and new tools of research constantly becoming available, the industry may find that a more extensive use of both sociology and mass psychology could be a help to better understanding of some of its problems in the foreign field.

Social science could be an aid both in the solution of specific problems within the field organizations as well as in drawing up over-all policies for dealing with the more general problems abroad. Even if social science will produce no miracles, it might prevent a few blunders now and then.

It is rather significant that even some of the larger concerns had to find out the hard way that they'd better take a close look at the wives of some of their personnel before sending them abroad, thus eliminating the "corner drugstore" type that will never create any company goodwill. Likewise, there was a time when some oil companies operating in a certain country virtually created a fifth column within their own organization by having widely different pay scales for expatriate and some native personnel, who, besides being equally capable, in a sense were just as "expatriate" as our own people. Although many such situations have since been corrected, there is still room for improvement.

A more scientific approach to some of the problems which the industry faces abroad is all the more imperative because what seems so obvious is often not true in the socio-economic field.

Social science, long laggard, is today rapidly developing tremendous possibilities, as some fascinating new experiments have shown. Many years ago the industry reluctantly accepted the geologist as a help in finding oil, and thus recognized the value of what then used to be called pure science. Later on, it became clear that the services of the paleontologist or the seismographer could become quite profitable. More recently, the oceanographer and the personnel psychologist joined the ranks of oil men. In the foreign field, social science may be next to make a contribution.

To operate successfully on a worldwide basis, the oil industry requires economic stability. To get economic stability it needs political stability first. This stability cannot be taken for granted but must be created.

The recent experience in Iran shows clearly that social and political upheaval can easily lead to economic disaster. For example, Peru and Israel have just passed petroleum laws which might induce some American companies to go in. It is especially in this stage, when operations are just starting, that a little social planning can be extremely useful. More than in any other field, in human relations an ounce of prevention is worth a pound of cure.

Opportunities

In the past, searching for oil abroad has been almost identical with converting jungle or desert into civilization. More than any other industry the petroleum industry deserves credit for raising the standard of living of backward nations. In the future some of the major companies may find it to their advantage to take an active part in even more general economic development abroad, provided their resources permit them to do so.

It has been said often enough that in order to reduce world tension we must harness the world's resources to assure people all over the world a basic minimum. Oil workers' high pay has sometimes created problems in the past, particularly where a more general development of local industry lagged far behind, thus failing to raise the general standard of living proportionally.

Some of the largest concerns have had a keen eye for this problem. For example, both the Standard Oil Company of New Jersey and Socony-Vacuum Oil Company have shown considerable interest in Nelson Rockefeller's Venezuelan Basic Economy Corporation, which was designed to provide that country with a more balanced economy.

It is no coincidence that while the 19th century taught us that the needs of the poor could no longer be disregarded without incurring the danger of revolution, the 20th century appears to teach us that the needs of the underdeveloped countries can no longer be disregarded without causing severe instability, tension or even war.

Along more conventional lines, the petroleum industry possibly could try to achieve greater collaboration in bringing about more standardized petroleum laws in the various countries. Naturally, the fact that operating conditions vary greatly in different parts of the world will make it more difficult to translate equal treatment under equal conditions into proper legal terms.

Although normal competition will tend to strike the correct balance here, the long time-lag in oil development makes it imperative that both the governments and the industry as a whole employ a farsighted approach to establish the right legal formula. The attitude of the American companies which extended the Venezuelan 50-50 profit sharing device to the Middle East has been an enlightened example in this respect.

As oil today affects the lives of so many people, this point appears to be rather vital, for if there are too many upheavals, clamor for some form of international control of the industry from certain quarters will become another item to contend with.

(First of Two Parts)

By CAPT. R. H. MEADE, USN
Director, Naval Petroleum Reserves

Supplies for parachuting in the field are loaded on C-46 at Umiat air strip.

Operation Alaska

- **What is the difference between a Naval petroleum reserve and commercial field?**
- **How are special problems of Arctic activity overcome?**
- **When will success or failure in search for oil be determined?**

EVERY HISTORY student is familiar with instances in which military forces of nations have extended their influence in the remote areas by exploration, sometimes aided by the force of arms but often without the firing of a single shot. It is not surprising, therefore, to note that the U. S. Navy has on many occasions extended the influence of this nation in remote places by exploration.

For example, the two places in the world long considered the most remote and inaccessible have been the North Pole and the South Pole. The success of Rear Admiral Robert E. Peary, a distinguished civil engineer officer of the U. S. Navy, in his Arctic explorations and of Rear Admiral Richard E. Byrd of the U. S. Navy in the opposite part of the world, the Antarctic, are well-known.

It may be concluded, therefore, that exploration is nothing new to the U. S. Navy and that there have been many instances in the past where our Navy's efforts have increased knowledge of the remote places of the world. In spite of this background, the exploration our Navy is now undertaking in the northern-most limits of this continent in and near Naval Petroleum Reserve No. 4, in Alaska, has presented many new and unusual problems.

In a previous article[1] the writer discussed some of the basic thinking underlying the establishment and operation of Naval Petroleum Reserves. These philosophies boil down to a determination to stockpile in the ground a petroleum supply which may, in time of gravest emergency, be used when specifically authorized by joint resolution of Congress to meet direct military operational requirements when normal sources fail to produce an adequate supply.

Further, the areas to be so used are limited to those portions of the Public Lands set aside by law and executive action for this purpose. Beyond these basic principles, few, if any, other differences remain between a Naval Petroleum Reserve and a commercial oil field. Essentially, both fields have the same problems including exploration, development, production and disposition of the products.

This has been recognized by the Navy and great care has been taken to obtain the services of outstanding consultants and advisors who are thoroughly familiar with commercial practices. In this manner, the Secretary of the Navy is better able to discharge the responsibilities assigned to him for the administration of the Naval Petroleum Reserves with full benefit of the latest advances in the industry and with assurances that the best commercial practices will be followed.

Why, then, are there any special problems involved in the administration of Naval Petroleum Reserve No. 4 in Alaska?

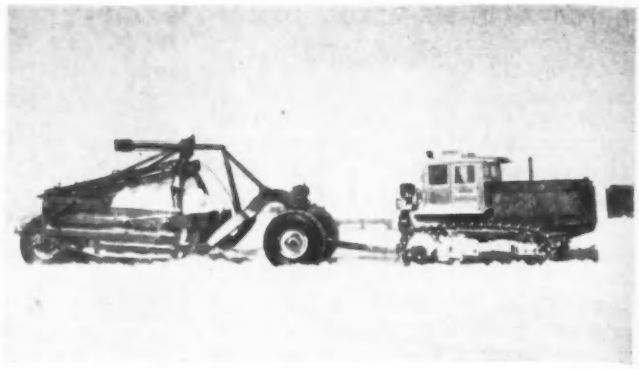
In the first place, two obvious problems occur: one is the location of the reserve in a remote area difficult to reach and with an extreme Arctic climate; and the second, from the size of the reserve itself, approximately 37,000 square miles now in the reserve plus an adjacent area of the Public Lands of nearly equal size.

For the reserve to be useful at all, exploration is necessary. The first step beyond mere custody in the administration of this reserve, therefore, involves sufficient exploration to allow a reasonable evaluation of the potentialities of the reserve and the adjacent Public Lands as a petroliferous province.

This sounds like a relatively simple and obvious statement. Yet, it is comparable, let us say, to an attempt before any oil discoveries were made to have attempted a reasonable evaluation of the potentialities of the State of Oklahoma as a petroliferous province. This effort, to make the reasonable evaluation described, is still in progress and it is not the intent of the Navy to enter into any development until that evaluation has been completed.

Tools of the petroleum industry have been brought into play: extensive surface geology, magnetometer surveys, the most modern geophysical methods and photogeology. As in the case of commercial exploration, experience has shown that the only

This view of pump section side of Naval Reserve No. 4 drilling rig shows how the operation is weatherproofed.



Here snow that plagues operations is being removed from base camp site at Point Barrow, Alaska.

positive method of locating oil and of rounding out a reasonable interpretation of the underground geology is by actual drilling.

In practically all of these procedures, although they are well known to the oil industry, special and unusual problems have occurred. Where these problems have arisen, special and unusual solutions have had to be devised.

When the decision was made to begin exploration in Naval Petroleum Reserve No. 4, the year was 1944—a war year. At that time the famed Naval Construction Battalions, or Seabees, were in full swing. This group had proved its ability to construct advance bases under the most rigorous conditions. So it was natural to look to them for assistance in establishing a toehold in the northern Arctic wastes.

Many Seabees had come from oil fields and many from the construction industry. A selected group from both of these sources was assembled into a Seabee detachment which constructed original camp facilities at Point Barrow and Umiat and made a beginning of the exploration. They proved that the problems of living in the Arctic could be solved and that oil exploration operations were possible.

As World War II closed, this valuable group dispersed and its members returned to civilian occupations incident to the general demobilization which occurred at that time. It was then that a civilian contract group was brought into the picture. This group, known as Arctic Contractors, Inc., included three joint ventures: Exploration Contractors, C. F. Lytle Construction Company, and the Green Construction Company.

As in the case of the Seabees, a combination of oil men and construction men proved a very happy solution. The experience of the Bureau of Yards and Docks and the Civil Engineer Corps of the Navy in the administration of contracts in remote areas of the world was drawn upon. The basic exploration contract has been made by the Bureau of Yards and Docks and the field guidance and control for the Navy handled by officers of the Civil Engineer Corps. Geophysical work is being done by a subcontract with the United Geophysical Company.

Assistance has been obtained from many other agencies of the Government and from private industry. The U. S. Geological Survey has done the field geology, operated a geological laboratory at Fairbanks, and set up a Navy Oil Unit within the framework of the Geological Survey to review continuously and interpret the field work.

All this information will be made available to the public for its value to scientific and commercial organizations. Some information has already been published. In addition, the Director of the U. S. Geological Survey has personally acted as an advisor to the Secretary of the Navy on the conduct of the exploration.

Transportation throughout the vast Reserve has presented major difficulties. Delivery of materials by air and access to remote locations were first accomplished by military airplanes. Later and up to the present, it has been found advisable to enter into contracts with civilian airlines to provide freight and passenger service from Fairbanks to the reserve and "bush plane" service from the major bases within the reserve to the outlying locations.

Much ingenuity in the use of air support has been required—using ski planes in winter, float planes in summer operations, wheels for all-year fields, parachuting of supplies to small parties in remote locations, and the experimental use of helicopters.

The use of tractor trains across the frozen wastes has been much publicized. This operation involved real pioneering and ingenuity, and it has developed to the point where it is relied upon regularly as the major method of providing transportation of supplies to reserve drill sites. It is possible to deliver material into Fairbanks for the Reserve by boat, by the Alaska railroad or by truck via the Alaskan highway. Deliveries north from Fairbanks must be by air.

An obviously more economical method of delivery is by ship into Point Barrow. But the Arctic Ocean is open only for brief periods during each year; therefore, the major delivery of materials is accomplished by annual ship expedition to Point Barrow. This means long-range planning to meet the supply problem as the scope of the next year's operations is determined by the size and content of the ship expedition for the previous year.

The reserve has been described as previously unexplored. This is not entirely true, for Eskimos have long inhabited the area. They are cooperative and their knowledge of the area has been of great benefit. Many have been employed on the exploration operation. Some have become skilled mechanics.

A few Eskimos said in the early days of the exploration that the white man would find it impractical to carry on operations through the Arctic winters. However, by winterizing drill rigs and camps, operations throughout the entire year have been found feasible. For certain operations, such as delivery of materials by tractor trains, the winter with its severe sub-zero temperatures is really the best time of the year.

Many special problems arise from the existence of permafrost, that is, ground permanently frozen from a depth close to the surface to varying depths down to approximately one thousand feet. On the surface, permafrost has presented special foundation problems. The most common solution of foundation problems has been to use wood piling driven entirely into the permafrost that is unaffected by changes in the surface temperature.

In the case of drilling rigs, this method of pile foundations was first used and was found to be successful although expensive. One of the established precepts in working with per-

mafrost, however, is to work with the permafrost rather than against it.

An ingenious use of this principle has been developed in recent years in connection with the foundations of drilling rigs. It was reasoned that if the upper layers of the ground were not allowed to thaw out, the frozen ground would provide adequate strength to support even the largest of drilling rigs. To accomplish this, refrigerated fluid has been circulated through pipes under the rig foundations to assure that the earth beneath the foundations would never thaw. This solution has been economical in time, effort and adequacy.

Interesting new problems relating to drilling and production in and through the permafrost exist in the reserve. Pioneering has afforded much new information. It is too important a subject to be omitted here; but a full discussion would require a separate article in itself.

Experience Aplenty

As has been pointed out, Arctic Contractors includes a group known as Exploration Contractors, composed of persons with long experience in exploring for oil. In addition, the Secretary of the Navy has been advised by a group of consultants including the Director of the U. S. Geological Survey; the firm of DeGolyer and MacNaughton, Dallas, and Walter A. English, consulting geologist, Los Angeles, Calif.

The Bureau of Mines has conducted valuable studies particularly in the Umiat field and provided valuable advice, information and assistance. Its laboratory at Bartlesville, Oklahoma, has tested samples of water, natural gas, and oil found in the reserve. In addition, visits of inspection by responsible members of commercial oil companies engaged in exploration have been welcomed and the opinions and advice of these representatives of private industry have been found most valuable.

It is anticipated, as times goes on, that information and results obtained in the Navy's exploration will be published. It is hoped that this will result in free exchange of useful information of mutual benefit to the Navy and to private industry.

Almost as soon as some of the basic problems involved in occupying the Arctic areas of Naval Petroleum Reserve No. 4 were solved, it became apparent to other agencies that here was an opportunity for exploration and the development of scientific knowledge in many directions, often far-afield from exploration for oil. For an idea of the variety of scientific information which has been made possible by the presence of the oil explorers, it is only necessary to glance at some of the agencies which have been and are now engaging in the development of diverse scientific information, or which have relied upon the oil exploration operation for support.

- Alaska Communication System, U. S. Army
- Air and Airways Communication System, U. S. Air Force
- Civil Aeronautics Administration, Commerce Department
- U. S. Coast and Geodetic Survey, Commerce Department
- U. S. Geological Survey, Interior Department
- Arctic Test Station, Bureau of Yards and Docks, Navy Department
- Arctic Research Laboratory, Office of Naval Research

This should not be viewed as a one-sided relationship as the oil exploration program has received substantial assistance from all of the above activities.

After some eight years of effort involving substantial expenditures of Government funds, the taxpayer may well ask what has been accomplished to date and what is left to be done in the completion of this attempt to evaluate the oil producing potential of this vast and previously unexplored portion of the nation's wealth.

Specific reports on the results so far obtained have been publicized in the past several years, and they may be summarized as follows:

- 51 percent of the reserve is workable and has been covered by surface geology, about 30 percent more has been explored but requires supplemental seismic work for interpretation, and 21 percent of the area has been explored by seismograph where the lakes and tundra hide surface rock exposures.
- Practically the entire area has been covered by aerial photography and by the airborne magnetometer.
- Through the northern and east central part of the reserve, many of the most obvious structures have been drilled at least once.
- A substantial amount of work is being done towards the identification and detailing of the structures in the southern part of the reserve near the foothills of the Brooks Range, which appear to have the best prospects for evaluating the oil potentialities of the older horizons of the area.
- An oil field at Umiat estimated to be capable of producing from 30 million to 100 million barrels of oil has been discovered.
- Oil in much lesser quantities has been found at Cape Simpson and at Fish Creek.
- Natural gas has been found in appreciable quantities in five locations. The most important of these discoveries have been found in Cretaceous rocks.

The trend of the information so far obtained indicates that the Cretaceous probabilities for oil and gas finding in northern Alaska have many points of similarity with the Cretaceous discoveries in the Rocky Mountain areas of the U. S. and Canada. These discoveries in themselves, although they prove the existence of oil and gas in the Cretaceous rocks, are not yet considered to be enough to warrant development.

The fields discovered, if situated within the continental U. S., would probably rank as the equal of many commercial fields in the U. S. The problems presented by cold weather, remote location and transportation, however, require the assurance that relatively large amounts must be producible before Arctic fields can be considered competitive with fields within the continental U. S. The exploration intended to be undertaken by the Navy in the Cretaceous rocks is not yet complete. There are still a number of interesting structures to be tested in connection with a first evaluation.

Further Tests Needed

Further, in the foothills areas adjacent to the Brooks Range, it now appears that a number of deep tests looking toward information and potential production in the pre-Cretaceous rocks must be undertaken before even a first evaluation of the Reserve can be made.

Customarily, the Navy assembles at least twice a year a group of highly-qualified advisors to give guidance in this exploration program to the Secretary of the Navy, the Director of Naval Petroleum Reserves and the organization working under their direction. The most recent meeting of these advisors was held in the Director's office in Denver in April.

At this meeting, the advisors stressed the need for pre-Cretaceous tests. So, at least three or four tests of the most obvious pre-Cretaceous possibilities are planned—at a probable rate of one such deep test each year. Simultaneously, additional tests will supplement the information already obtained from the discoveries in the Cretaceous rocks.

Hope is held that this exploration will determine whether immediate Alaskan oil development is justified, or whether it should await the future need for new sources of crude.

REFERENCE

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Austrian Oil a Victim of Tensions

The same old story of West vs. East holds the nation's petroleum in grip of despair.

By G. G. ROSU

THE SOVIET note on the Austrian State Treaty, sent the Western Powers last August 14, has destroyed even the last hope of optimistic observers that Austrian oil industry may become free again.

Further moves from the present deadlock seem to have been definitely blocked unless, of course, Western Powers and Austria are willing to make new concessions of such a nature that they would tear down the formers' political set up in Central Europe. But if such concessions were made, Russia is not willing to give any assurances that it will respect Austria's independence. Hence, the price demanded for a mere fiction appears too high.

No post-war international issue has been debated more and none has generated more bitterness among the Great Powers than has the problem of Austrian oil. Other major issues—such as the German problem, the disarmament issue and the Japanese treaty—took, for a while, the limelight of international meetings. But when the limits of permissible compromises were reached, the two opposing camps folded their tents, went home and devised solutions intended to suit their own vital purposes.

It was not so with the Austrian question, which remained constantly on the agenda of the Great Powers and, in all probability will remain there until a new and stable political constellation is formed. Beginning with the Moscow conference of October, 1943, the Austrian question has been carried to every political capital of the world—from Moscow and Potsdam, to New York, Vienna, Paris, frequently to London, and back to Moscow. Hundreds of high-level conferences and staff meetings have been held in an effort to find a viable solution to this question.

If the expenses of these meetings were added up, the total figure would go into many millions of dollars. Unfortunately, politics does not keep books, nor is it guided by the rule of proportionate returns. This may, however convey a relative impression about the international importance of Austria.

If a balance sheet of these exhausting endeavors during the last seven years would be drawn up, to the credit of the Western Powers must be booked their unremitting resourcefulness and patience in exploring every alley of approach and in using every means of compromise and persuasion available in their diplomatic bag with a view to giving Austrians an honorable State Treaty. To the Russian credit must be booked their unsurpassed talent to trade the same horse twice as well as their known disregard for every moral or time-proved standard accepted by international usage. Finally, on the credit side of the Austrian ledger will be booked the sturdy fight of a brave people trying to remain free.

German Assets. During lengthy post-war negotiations, the Austrian petroleum problem proved a far greater stumbling block to agreement than anything experienced thus far in respect to oil matters. It is, in any case, much greater than the oil issue in the negotiations for a peace treaty with Roumania or Hungary. And if the major role occupied by petroleum in the peace treaty with Roumania, in 1946, will be recalled, the above comparison may become even clearer.

For the record's sake, it may be recalled that at the Moscow Tripartite Conference of October, 1943, the Allies decided to treat Austria not as an enemy but as a liberated country. Hence, no reparations were to be exacted from her.

At Potsdam, however, the same Allies decided to uproot the economic relations of Germany and to liquidate her investments abroad (known since as German External Assets). A few months later, the Western Powers were forced to admit that the Potsdam Declaration was a vaguely worded agreement and that U. S. and British negotiators made, in the hurry characteristic of that meeting, many mistaken concessions.

One was the absence of a definition of the German External Assets which were to be liquidated, separately, by each Allied Power within its sphere of influence. Law No. 5, issued by the Allied Control Council for Germany on October 30, 1945, defined these assets, but the principle of liquidation by sphere has been enlarged. The law provided that this will be done by each power in its sphere of influence without having to account to any of the other powers, or to the institutions specially established for this purpose.

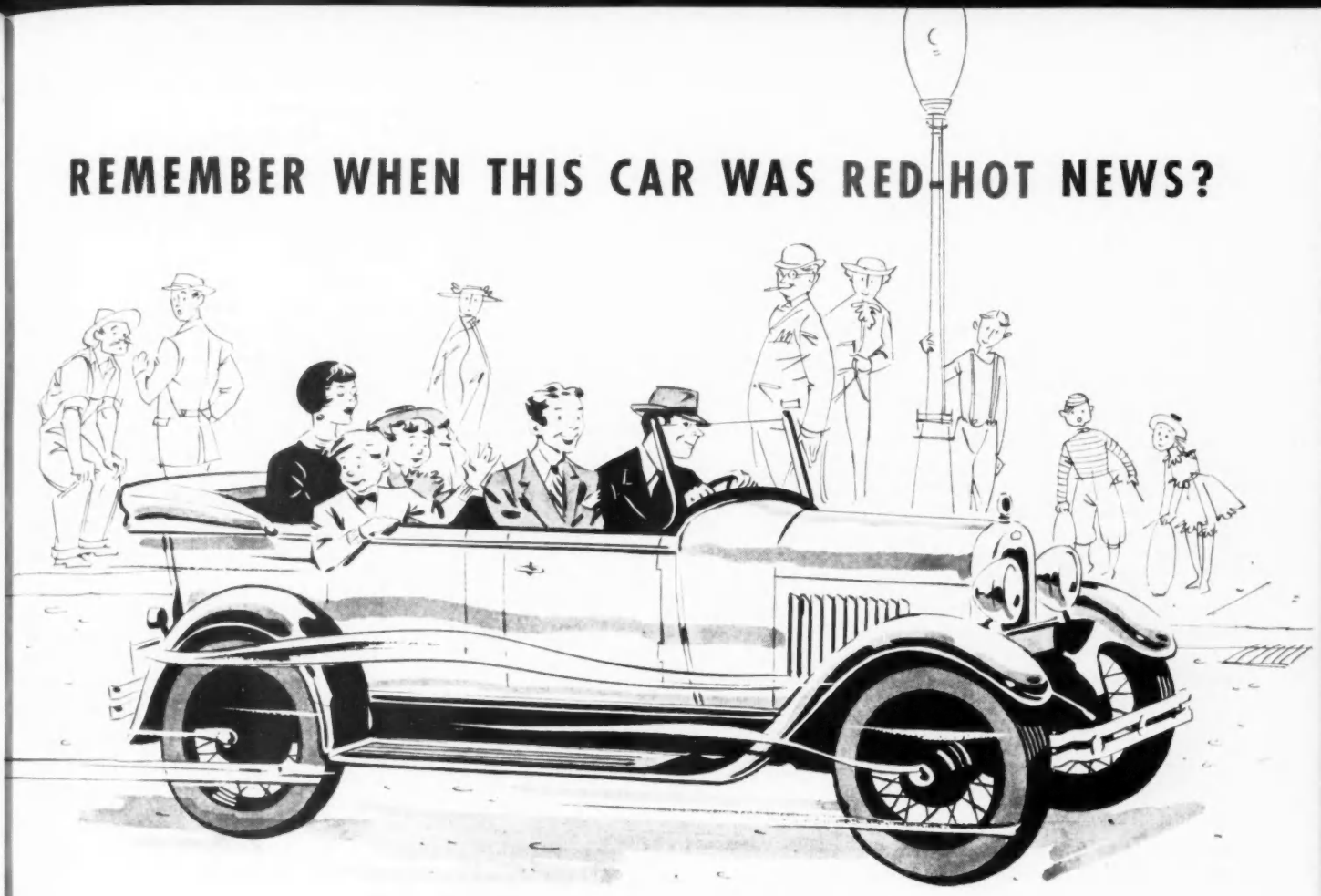
In accordance with their guiding principle, Western Powers sold most of the German interests and properties to private enterprises, whereas Russia turned them into assets of the Soviet State, thereby generating the seeds for a future conflict between sovereignties.

Ownership relations in the Austrian oil industry are so entangled that a separation of the actual German interests is well-nigh impossible, unless preceded by a lengthy legal search done by arbiters of good faith. Obviously Russia cannot be animated, in this case, of good faith.

As a result of the Caucasus destruction and slow development of the Eastern oil regions, Russia faced, in 1945, a shortage of liquid fuels similar to that which confronted Germany in 1942 (when, incidentally, she started reckless penetration into the Austrian oil industry). This shortage was—and still remains—the motive of the Soviet drive to permanently monopolize every oil field in the Satellite area.

After failing late in 1945 to establish a joint Soviet-Austrian petroleum company—patterned after the Rou-

REMEMBER WHEN THIS CAR WAS RED-HOT NEWS?



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manian model, Sovrompetrol—Russia seized and occupied militarily practically the entire Austrian oil industry. Austria answered by nationalizing—in July 1946—most of the oil companies, including those seized by the Russians. Impractical as it was in dealing with Russia, this measure, nonetheless, created a stalemate. At this point, the second solution was tried—direct negotiation for a settlement of the German assets as an issue of the Austrian State Treaty.

Article 35. After three years of negotiating, the Four Powers agreed on most of the 59 articles of a draft treaty for Austria. Most important of them was Article 35, which dealt with the German properties. But out of fear that this might create a dangerous precedent for her future purposes, Russia deliberately avoided defining what German assets are. According to the draft, German assets are those claimed by Russia as such and specified in attached lists.

Article 35 offers two novelties:

- A trial to settle, on a compromise basis and en masse, the much disputed question of the German properties.
- Despite previous Russian pledges to the contrary, Austria will have to pay reparations, though disguised, to Russia. These reparations consist of paying $150 million, ceding assets of the Danubian Shipping Company, located in the Soviet sphere, and of oil concessions, all in exchange for 286 industrial enterprises and about 400,000 acres of land and forests returned to Austria.

With respect to oil concessions, Russia demands 60 percent of the Austrian crude output as it was in 1947 (unofficially estimated at slightly more than 6 million barrels.) Under these demands, this share should be extracted directly by Russia from oil fields shown in Table 1, claimed as German properties, and on which development concessions should be granted to Russia for a 30-year period.

The list of fields in Table 1 respects the property title of Austrian and American-British interests in the Zistersdorf main field. However, it is doubtful that Russia will continue to be satisfied with the concessions wrung in 1949 (Table 1). The reasons are that, since 1949, Russia developed the promising deposits of Matzen, Aderklaa, Blockfliess, Langenzersdorf and Schwadorf which—with the exception of the first two—are not included in the list, and it is well known that Russia's appetite has always grown while eating.

Russia further demands concessions to 60 percent of the exploration areas claimed by her as German properties, for a period of eight years, and development concessions on the discovered formations for an additional 25 years. Up to the end of 1949—when Russia started to sabotage the Austrian State Treaty—there was still disagreement among the Four Powers concerning some of the exploration areas and the exact location of the concessions.

Table 2 describes Russian claims and the points of dispute.

Points of disagreement are:

- Claimed by Russia: Gross-Enzersdorf, 292,600 acres; Steinberg, 220 acres; Enzersdorf, 56,760 acres; Siebenhirten, 11,000 acres; and Schrattenberg, 8668 acres—totaling 369,248 acres.
- Offered by Western Powers in exchange: Laa an der Zaya and Hollabrunn, totaling 422,796 acres.

Thus, a difference of 53,548 acres exists.

Magnitude of the differences be-

TABLE 1

FIELDS:	In 1945 They Belonged To:	Estimated Crude Output In 1947 (Bbls.)
St Ulrich-DEA	Deutsche Erdoel A G	2,065,500
Muehlberg	ITAG	1,730,000
50 percent of Goesting-Kreuzfeld-Pionier	Erdoelproduktion-Gesellschaft mbH	356,600
St Ulrich-Niederdonau	Niederdonau-Erdoelgesellschaft mbH	159,700
		4,311,800

TABLE 2

Concessions to Exploration Areas to Be Transferred to USSR

The last stage of negotiation reached in December, 1949, by the Deputies of the Foreign Ministers during their New York Conference.

OIL COMPANIES:	SITUATION AT THE BEGINNING OF 1945 IN PERCENTAGE NATIONAL HOLDINGS: Austria	USA	Gr. Britain	Germany	OIL FIELDS INVOLVED:	Demanded by USSR Acres:	Western Powers' Alternative Proposal: Acres:
1. RAG Rohoelgewinnungs—A. G. Vienna	....	50	50	....	.....	....	....
2. Tiefbohrunternehmung Richard K. van Sickle, Vienna	....	....	100	....	.....	....	....
3. Gewerkschaft Austrogasco, Vienna	....	100	....	....	.....	....	....
4. Erdoelproduktionsgesellschaft m.b.H. Vienna	50	....	....	50	50 percent of Paasdorf, Klosterneuburg, Kilb, Nord Steiermark and Goesting	94,237	94,247
5. Niederdonauer Erdoelgesellschaft m.b.H. Vienna	....	11	11	78	Gross-Enzersdorf incl. Matzen and Aderklaa	385,000	92,400
6. Steinberg-Naphta A.G.	....	....	2	98	Steinberg	220	....
7. Kohle-Oel Union von Busse Kommanditgesellschaft, Berlin	....	....	....	100	Leithagebirge, Schrattenberg, Drasenhofen, Oedenburger-Pforte and Pullendorf	397,782	389,114
8. Gewerkschaft Elwerath Erdoelwerke, Hannover	....	....	....	100	Neusiedlersee and Siebenhirten	280,456	269,456
9. Preussische Bergwerks- und Huetten A.G. Hannover-Berlin	....	....	....	100	Mistelbach, Ameis and Oberlaa	142,736	142,736
10. Donau Oel-Gesellschaft m.b.H. Vienna	....	....	....	100	Tulln	83,754	83,754
11. Louis Ritz & Co., Hamburg	....	....	....	100	Korneuburg	66,000	66,000
12. DEUTAG Deutsche Tiefbohr A.G. Aschersleben	....	....	....	100	Enzersdorf	56,760	....
13. ITAG Internationale Tiefbohr-Kommandit-Gesellschaft, Celle	....	....	....	100	Hauskirchen (incl. Alt Lichtenwarth) and Leis	43,120	43,120
14. Wintershall A.G., Berlin	....	....	....	100	Grosskrut and Mittel Steiermark	39,248	39,248
15. DEA Deutsche Erdoel A.G. Berlin	....	....	....	100	St. Ulrich and Hausbrunn	2,398	2,398
Other Fields:	....	....	....	....	.....	....	422,796
						1,591,711	1,645,259

tween the two proposals, at least Gross-Enzersdorf, may cause some disputes and hard bargaining in any resumed negotiation.

In addition, Russia is demanding that the property title to several processing plants be transferred to her in perpetuity. To this, the opposite side has agreed—as shown in Table 3—only to a limited extent.

The Lobau plant (Table 3) belongs equally to Socony-Vacuum Oil Co., Inc., and to Royal Dutch Shell. After 1939, these companies turned Lobau over to their Austrian subsidiary, but remained stockholders in the latter. Without explanation, Russia militarily occupied, on August 2, 1947, the Lobau plant and has operated it since. This is the largest Austrian refinery and contains the only cracking installation available. It is, therefore, understandable why Russia wants it, with or without proper title.

Western Powers refused to transfer to Russia the property title of the Nova refinery (Table 3)—a French and Austrian interest. But they agreed to guarantee Russia that 3000 to 4000 barrels a day will be processed, on a permanent basis, at Nova, according to terms to be agreed upon between Russia and the Nova operators.

In 1940-41, Germans took about 30 car loads of refinery equipment from France and used most of it to enlarge and modernize the Mossbierbaum plant. Russians agreed in principle to return the identifiable French equipment and to retain the whole plant. Because of its unsettled status, Mossbierbaum's capacity is not included in the Russian list (which appears, thus, more modest than it actually is).

Western Powers, however, are willing to offer Russia the property title to the whole plant provided its capacity is included in the list of claims.

About the Author

G. G. ROSU, former assistant professor at the Institute of Economics of the University of Berlin and former economic counsellor of the Roumanian Ministry for Foreign Affairs, holds doctorate degrees in economics and law for which he studied at the Universities of Bucharest, Berlin and Paris. As Roumanian ministry counsellor, he was in charge of legal and political postwar problems of the Roumanian oil industry.

The Korneuburg plant was war-damaged but restored quickly to operation. This is a subsidiary of the Roumanian oil company Creditul Minier S. A. Bucharest which, since July, 1945, has been merged—with all assets and subsidiaries abroad—with the Soviet-Roumanian joint company, Sovrompetrol. In Russia's list, Korneuburg is included only with half of its actual processing capacity, a fact which again puts the Russian claims in a more favorable light.

The Voesendorf plant, offered by the Western Powers in compensation, was controlled by Creditanstalt-Bankverein, Vienna, until 1938. After Anschluss, this bank was practically swallowed by the German "Big Four" banks, and Voesendorf transferred to the German state holding A. G. der Kohlenwertstoff-Verbaende, Bochum, established in 1940. Hence, it is now claimed as a German property.

At first glance, the refinery list should not be a stumbling block to a final understanding, as both lists include a primary distillation capacity of 11,500 barrels a day. Nonetheless, the Lobau question is of a nature to delay the final agreement, for these reasons:

- Russians are demanding that property title to processing plants include all adjacent and servicing installations (power and steam generating plants, workshops and labs, tankage and depots, loading ramps and river moorings, office and living quarters, and pipe lines.) The latter include the Lobau-Zistersdorf-Czech frontier pipe line, completed during the war by RAG. The owner of Lobau would therefore control, in addition to a substantial part of the domestic pipe line transportation, the Austrian end of the Zistersdorf-Roundnice pipe line situated 22 miles north of Prague.
- At Lobau are situated large storage tanks belonging to Wirtschaftliche Forschungsgesellschaft m. b. H. which was sponsored by the German State. Lobau therefore, is a sensitive point the possession of which could give Russia a quasi-absolute control over Austrian oil industry. To avoid this, the Western Powers have proposed that this pipe line, together with WIFO tankage, become the property of the Austrian State and that the latter assume the duties of an indiscriminating common carrier for all the parties.
- Russia claims property title to five additional distributing companies, including their installations, (depots, pipe lines, pumps and ramps) regardless of the zone in which they may be situated, as well as to all oil depots located at Winterhafen-Praterspitz

TABLE 3
Austrian Processing Plants Demanded by Russia

PROCESSING PLANTS:	Location:	Title Holder:	Actually Belonging To:	PROCESSING CAPACITY CLAIMED BY RUSSIA: BBLS./DAY		ALTERNATIVE PROPOSAL OF THE WESTERN POWERS: BBLS./DAY	
				Primary Distillation	Cracking	Primary Distillation	Cracking
Lobau	Lobau	Ostmaerkische Mineraloelwerke G.m.b.H. Vienna	USA, British and Dutch interests	4,900	780		
Nova	Schwechat	Nova Oel-und Brennstoff-Gesellschaft A.G.	Mostly French interests	4,200		4,000	
Korneuburg	Korneuburg	Korneuburger Mineraloelraffinerie A.G.	Roumanian and Russian interests	2,400		2,400	
Mossbierbaum	Korneuburg	Donau-Chemie A.G. Vienna	Austrian, German and French interests			4,000	
Okeros	Stockerau	(Ozocerite refinery)	Mostly German interests				
Voesendorf		A.G. der Kohlenwertstoff-Verbaende, Gruppe Benzin-Benzol Verband, Bochum	Austrian interests			1,100	
Total Capacity:				11,500	780	11,500	

and Mathausen. Western Powers agree only to the transfer of those assets situated in the Soviet Zone, and only to the depots belonging to these five companies.

A further Russian claim to title over five gas distributing companies does not meet with Western agreement. The Western approach is that, although these companies distribute gas (in addition to that from Neusiedl an der Zaya) originating from prospective Russian fields (Aderklaa and Matzen of the Gross-Enzersdorf), the distributing apparatus should be in Austrian hands since its operator is in a position to dictate the Vienna gas supply.

Victim of Tensions. The quasi-compromise reached in June and December, 1949—as revealed above—did not cover all the issues of the draft treaty: five were still outstanding. Article 48 bis—directly connected with this discussion—obliges Austria to acknowledge and settle all loans, supplies and services delivered to her by the occupying powers between May 8, 1945, and the coming into force of the State Treaty. Whereas Western Powers instantly waived their claims, Soviet claims remained to be agreed upon through bilateral Soviet-Austrian negotiations. The Austrian Government submitted to Russia far-reaching proposals for a direct and speedy settlement of the Soviet claims outside the scope of the treaty. However, the Soviet Government has, since 1949, asked for more time to examine these proposals. During the last three years, this pretext has been constantly used by Russia and has been instrumental in torpedoing all subsequent Four Powers meetings called on Western initiative.

Since May, 1950, Russia has demanded the amendment of already-agreed texts of the draft treaty—which is unusual—and has made any progress on the Austrian issue conditional upon prior settlement of the Trieste issue. That is without precedent.

The last phase of the Austrian negotiations started last March 13, when Western Powers sponsored a new and abbreviated text for an Austrian State Treaty, and invited Russia to resume negotiation on this new basis. Of interest in this discussion is Article 6, which provides that, within 90 days after ratification, the occupying powers should "relinquish to Austria all property . . . of whatever description, held or claimed by them as German assets, or as war booty, in Austria."

To this, Russia answered as late as last August 14. Her first condition is that the Western Powers withdraw their "skeleton treaty" and resume negotiation on the basis of the old draft. The resumption is conditional upon such wide and completely new clauses(North Atlantic Pact, Trieste, eradication of Nazism, demilitarization, etc.) that Russia actually is submitting for negotiation a new draft treaty.

Since early in 1952, there has arisen a new Austrian issue which has very little, if anything, in common with the old issue. Austria now is a strategical factor whose possession may greatly influence the cold war-cold peace relationship. She has common frontier with six countries (two of which are Russia's satellites) and is the link which can keep together or divide Central Europe. In Russian hands, Austria will help a Russian westward advance and thwart the strengthening—even menace the very existence—of the West European Power Center.

As long as the satellite countries constituted Russia's cordon sanitaire towards the West, the latter was, in principle, inclined to compromise on the Austrian issue against essential and lasting economic advantages. However, since the complete assimilation of the satellite area into the Soviet empire (1950), Russia has striven to establish a new line of "friendly governments" farther West, in Central Europe. Hence, Austria ceased to be, for Russian purposes, object of a compromise.

In this new political constellation, Austrian oil became a trivial question. Acceptance by the West of all pending differences and of Russian claims can no longer bring the independence for which the Austrian people have longed since March, 1938.

Its solution transcends the give-and-take level into the geopolitical sphere where only balances and strengths count. Or, in the words of the Austrian foreign minister: "Once the potential powers [of the opponents] are converted into actual strength, a solution will be found surprisingly quickly. We sincerely hope that it will be a peaceful one."

Of World

D. A. Fuller

F. A. Madill

Imperial Pipe Line Co. Ltd., of Edmonton, Alberta, announced the appointment of two Edmonton men to executive posts.

FLOYD A. MADILL, former chief engineer, was named general superintendent. Born in Edmonton and a graduate of the University of Alberta, he has been associated for the past 12 years with Imperial Oil Ltd., subsidiary of Standard Oil Company (New Jersey). He joined Imperial Pipe Line Company, an Imperial Oil subsidiary, in 1947, and became chief engineer in 1950.

DONALD L. FULLER, former assistant chief engineer, has been appointed chief engineer, succeeding Madill. Born in Edmonton, Fuller is a graduate of the University of Saskatchewan. Following five years air force service, he joined the staff of Imperial Pipe Line Company in 1949.

•

W. B. HAYES, formerly drilling superintendent of International Petroleum Company in Peru and Colombia, has accepted a position as manager of operations for Dunlap & Graham Drilling Company, Inc., in Colombia. He will make his headquarters in Barranquilla.

•

ALBERT GREGERSEN has been named executive assistant (area manager) in the New York Foreign Production Division of Gulf Oil Corporation and will continue to act as that department's government relations advisor. E. E. FERRIN has been named technical advisor; C. W. FLAGLER, exploration advisor; L. C. SASS, assistant exploration advisor, and WOLFE J. FRANKL, economic advisor.

•

DR. G. M. LEES has been reelected to serve a second year as president of the Geological Society of London. Dr. Lees is chief geologist of the Anglo-Iranian Oil Company.

Oil Men

G. W. ORTON has been appointed resident director in the United Kingdom of affiliated companies of California Texas Oil Company, Ltd. He will also serve as a director of Regent Oil Company, Ltd. A native of Texas, Orton received his B.B.A. degree from the University of Texas and joined The Texas Company in 1928 at Houston. After 24 years service with Texaco, he joined the Caltex Group in 1952. Prior to his association with Caltex, Orton was general manager of foreign operations with The Texas Company.

G. W. Orton

•

J. A. JAMESON, C.B.E., who has been associated with Anglo-Iranian Oil Company, Ltd., and its predecessor company since 1909, has retired as a managing director. He first became a director of the company in 1939.

•

T. L. LENZEN, manager of Standard Oil Company of California's Eastern Hemisphere Operations has been elected a vice president. Lenzen, who has been associated with Middle East oil since 1938, is also a director of Bahrein Petroleum Company, California Texas Oil Company and Overseas Tankship Corporation. He first joined California Standard in 1928.

T. L. Lenzen

•

E. J. VALENCIA and LLOYD L. ALLEN have been elected to the board of directors of Canadian Bishop Oil, Ltd. Valencia is treasurer of Bishop Oil Company and Allen is a member of the planning committee of the same firm.

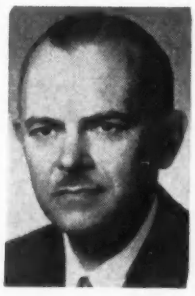
Valencia recently returned to San Francisco after a business trip to Canada.

•

Appointments to four executive posts in Australia and the Philippines have been announced for the Caltex Group, which operates principally in the Eastern Hemisphere.

A. J. HERRON, former assistant superintendent of the Bahrein Petroleum Company Limited's Bahrain refinery, has been appointed general manager of Australian Oil Refining Pty. Ltd., in charge of operations of the new company.

Representatives of the Anglo-Iranian Oil Company who are on a tour of the U. S. to observe drilling operations attended the recent American Association of Oilwell Drilling Contractors convention in Oklahoma City. Seated, left to right, are Charles Spence, Peter Jones, Mark Howard, George Rogers, R. H. Hewitt and Alan Churchill. Standing: M. M. Ramage, R. H. W. Ambrose, Dugald MacGilp, W. J. Alexander of the Dallas AAODC staff, who is assisting the British group in behalf of the association; W. T. Irvine, R. W. MacFarland and T. Wilson.



R. W. Parker

W. G. Miller

R. W. PARKER, former general manager of Societa per Azioni Raffineria Padana Olii Minerali (SARPOM), Caltex Group affiliate, has been named project manager in charge of all phases of design, field construction and other activities directly related to the erection of the Australian Oil Refining Pty. Ltd. refinery at Kurnell, Australia.

W. G. MILLER, formerly in charge of various construction projects in Australia, Sumatra and New Jersey, as project manager, has been placed in charge of all phases of field construction, designs and other activities related to the building of Caltex (Philippines) Inc.'s Batangas refinery in the Philippines.

L. D. JOSEPHSON, formerly superintendent of personnel at Bahrain, has been named refinery manager of Caltex (Philippines) Inc.

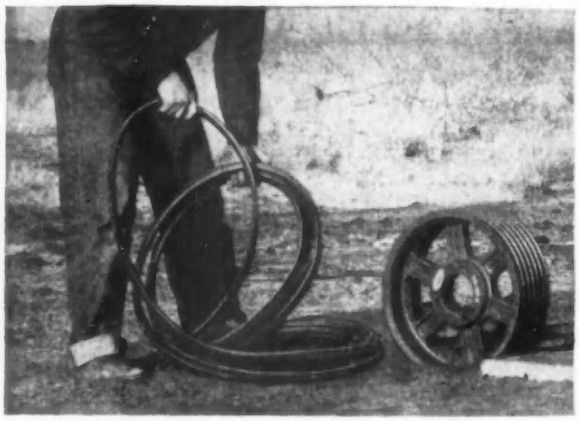
CHARLES R. HETHERINGTON, formerly Ford, Bacon & Davis, Inc.'s engineer in charge of pipe line design, has been appointed vice president of Westcoast Transmission Company Limited. He was associated with Westcoast's projected natural gas pipe line from Alberta to the Pacific Northwest for more than three years.

A graduate of Oklahoma University and of Massachusetts Institute of Technology, Hetherington has spent almost all his career engaged in the petroleum and natural gas industry in the refining, petrochemical and pipe line divisions. He designed the Michigan-Wisconsin pipe line to Detroit, including underground storage of gas in depleted fields, and the Algonquin Gas Transmission pipe line to New England. He has also been a consultant for a number of natural gas organizations, including Michigan Consolidated Gas Company and Southern Natural Gas Company.

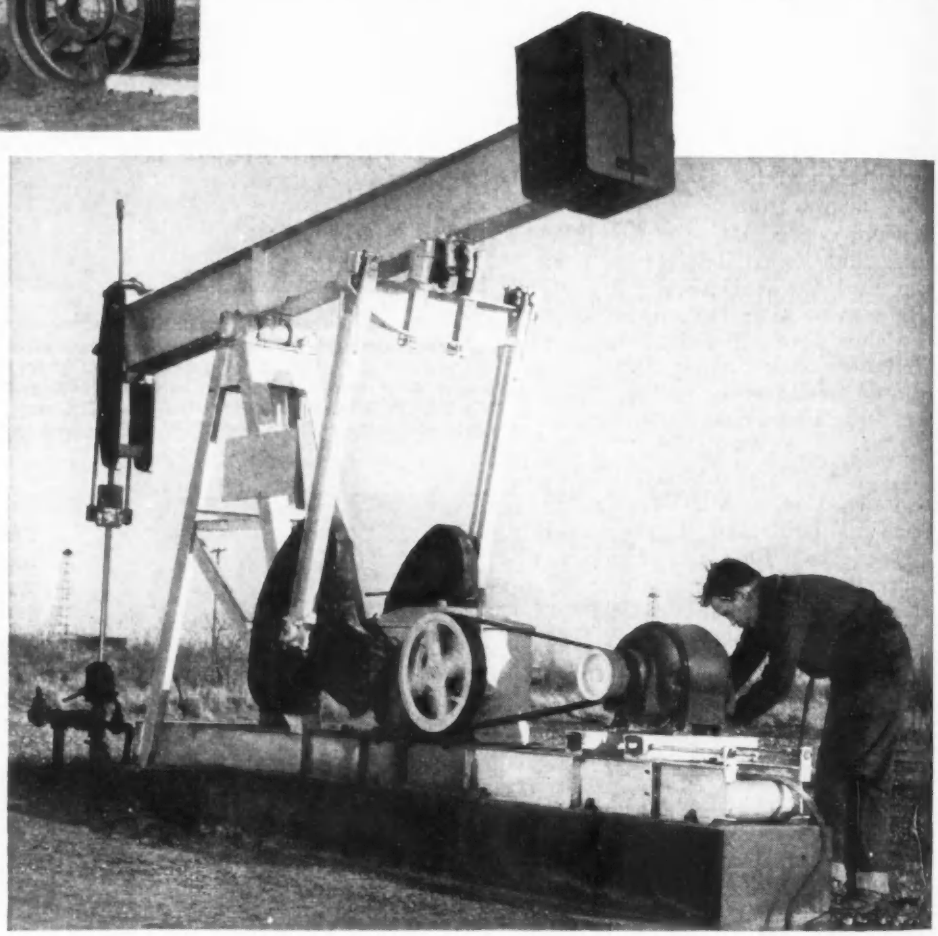
He is a member of the American Gas Association, the American Chemical Society, and is a registered engineer in various states and Alberta.

•

The board of directors of Bishop Oil Company has appointed an executive committee to study and make recommendations for the financing, organization and development of an expanded Canadian program by the company's new subsidiary, Canadian Bishop Oil, Ltd. The committee includes WILLIAM WALLACE MEIN, JR. chairman, LOUIS J. BRUNEL and CHARLES W. FAY.



How much difference can this sheave make . . .



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MV.2.9

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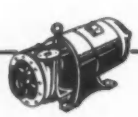
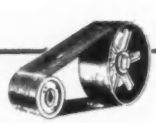


PUMPS:
CENTRIFUGAL, ROTARY, STEAM, POWER



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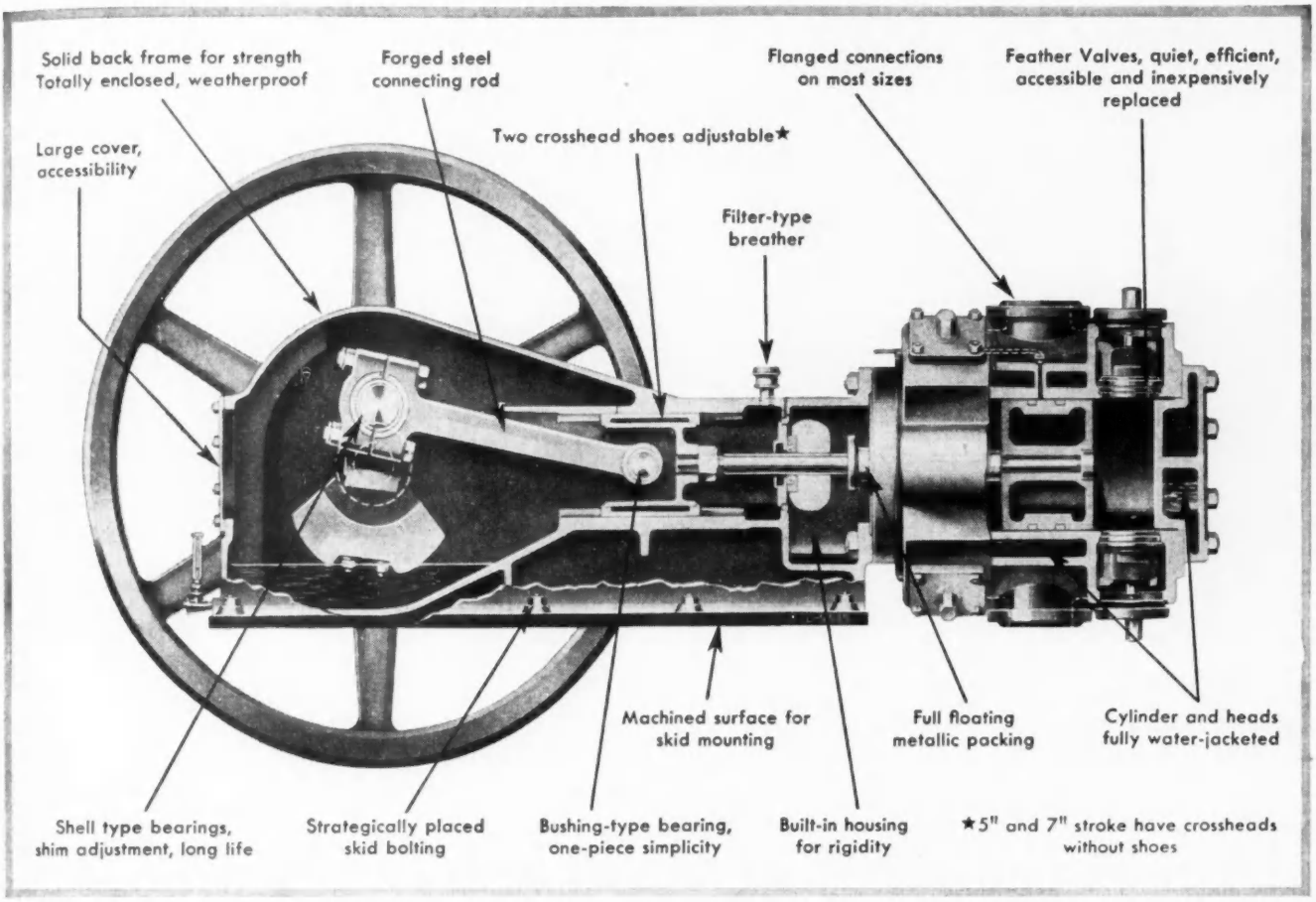

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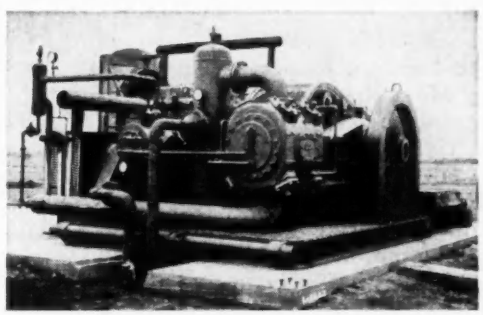

OUTDOOR INSTALLATION of a 16/7½ x 12 Type HB Horizontal Packaged two-stage gas compressor—ready for lifetime of service.

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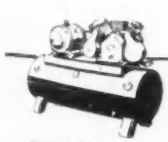
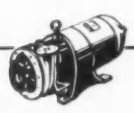
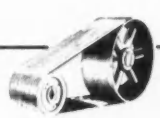


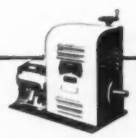
COMPRESSORS: AIR COOLED, WATER COOLED



PUMPS: CENTRIFUGAL, ROTARY, STEAM, POWER



MULTI-V-DRIVES: QD SHEAVES AND V-BELTS



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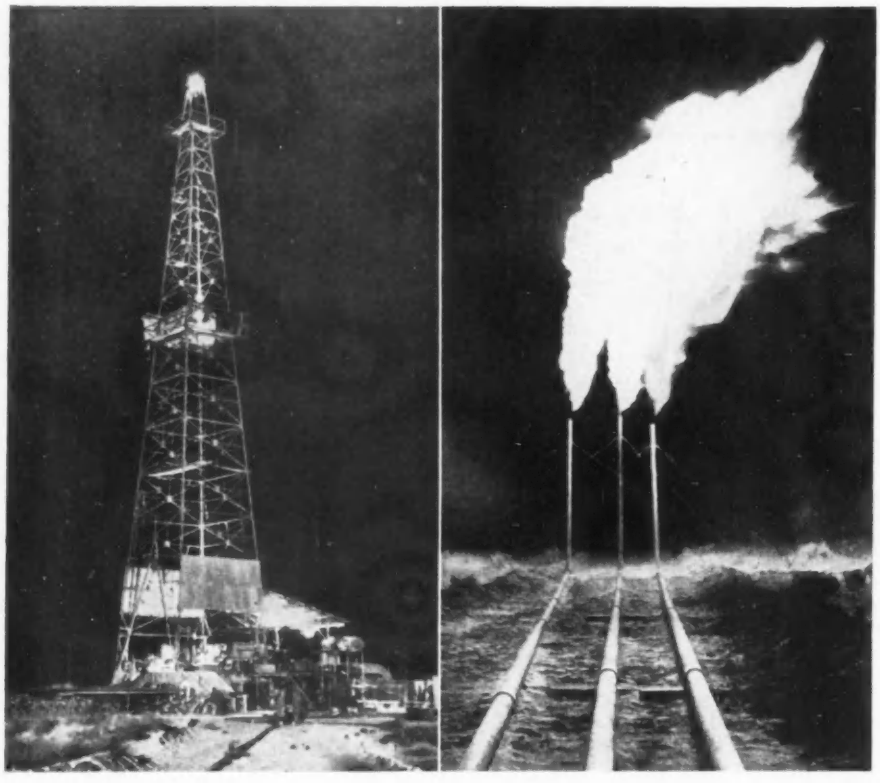

A natural gas pool has been discovered in Sui, Dera Bugti, Baluchistan, in the first well drilled there by Pakistan Petroleum Limited. Tests are being made to determine the productivity of gas accumulation. The company announcement said that to determine the extent of the gas pool another well will be drilled in the area. Discussions are reported being held between government and the company regarding use of this gas. Pakistan Petroleum started drilling the first test well in the Sui desert on October 10, 1951, and drilled the well to a final depth of 10,049 feet in July of 1952. Production tests have been made at various levels without finding any oil. Left is Sui Well 1 lighted by gas flare. Right is natural gas flare at Sui 1 during production test.

A WORLD of OIL

By **DON KLIEWER,** WORLD OIL Staff

SUMATRA: The State Mining Commission has voted, 4 to 3, to return oil wells and installations in North Sumatra to Bataafsche Petroleum Maatschappij, the prewar concession holder. The Economic and Financial Board has confirmed the decision, which is now awaiting signature of the Minister of Economic Affairs . . . But the fight is not ended. Objectors to the commission action are expected to carry on to Parliament the fight against restoration of wells to original exploiters. Currently, oil production in the area involved is being handled by an Indonesian concern.

ITALY: Construction of the pipe line from Genoa to Milan (Rho) and from Vado Ligure (Savona) to Recate (Novara) has attracted the attention of Swiss oil interests which have submitted to Italy's Parliament a proposal to build a pipe line from Trecate or from Milan (Rho) to Locarno, Switzerland, through which the Swiss Confederation would import crude and products. . . . Oil structures have been discovered in the zone between Roccapalumba Alia and Agrigento by wildcats, and trial wells are being readied. . . . A rig is operating in Turin province between San Benigno and Orco river for Azienda Generale Italiana Petroli following discovery of an extensive crude and gas structure at 6232-8200 feet. . . . Italian industrialists have begun gas exploitation work between Vicenza and Recoaro where, at a depth of 3936 feet, natural gas traces have been found. The gas yield of this district will be grouped with the Ferrara district output to feed the gas lines connecting Po Valley resources with Porto Marghera industrial zone in Venice. Additional gas from Vicenza will be used for the operations of wool mills in Schio and Valdagno. . . . The Fiat Company has wholly replaced coal with gas in all evaporating plants in its automobile and steel works.

CANADA: An important discovery during November in the northwest Alberta and northeast British Columbia gas export area resulted in a daily gas flow rate of almost 7 Mmcf from drill stem tests in the Cadomin formation. This strike, in Buick Creek area, is about 40 miles northwest of the Pacific Group's Fort St. John development operations. In on the discovery with a quarter interest each, were Texaco Exploration Company, Canadian Gulf Oil Company, Socony-Vacuum Exploration Company, and Shell Oil Company.

MIDDLE EAST: During the Superior Oil Company's fiscal year ended August 31, 1952, the company withdrew from further exploration work and surrendered the concessions held by it or its subsidiary operating in the area. No wells had been drilled or production obtained.

BORNEO: A submarine oil drilling operation is scheduled to get under way from a South China Sea bed platform about a mile off the coast of British Borneo. Object: a possible extension to Shell group-operated Seria oil field, the single largest oil field in the British Commonwealth.

YUGOSLAVIA: Geological activity has indicated the existence of crude deposits near Agram, in the Slovenia and Bosnia Provinces, in the Banat region and near Medjumure—the last two with large reserves . . . Natural gas has been found in 40 spots, 28 of which are being exploited now that plants are partly finished . . . The Rujeka, Sisak and Bosnian-Brod refineries, which were partly destroyed during the closing months of World War II, are once again in full operation.

HUNGARY: Difficulties are mounting for the Soviets in the operation of the Zala oil field—the government's mining officers have complained that oil field workers are treating the Soviet method of fast drilling with negligence and the trade unions are not supporting a drive for faster drilling.

THE NETHERLANDS: Progress is reported in the laying of a network of natural gas pipe lines in the eastern part of Holland. When completed the lines will cover between 250 and 375 miles and will transport gas to Oldenzaal, Almelo, Hengelo and Enschede towns . . . Nederlandse Aardolie Mij. intends to exploit the gas discoveries near Wanneperveen,

Tubbergen and Breklenkamp. NAM has 11 gas wells in East Holland.

AUSTRIA: The greatest volume of heating oil since the end of World War II is available in Austria. Soviet Mineral Oil Administration supplied more than 4 million barrels to Austria during the past year . . . Austrian economists said recently that most of the former steam power plants have been remodeled for use of oil . . . Octane rating of Austrian-produced gasoline will be raised from the present 55 octane to stimulate SMOA products sales. Raw alcohol, a by-product of the large paper and cellulose industry, and benzol will be used as mixing fluids to raise the octane number to 70 . . . Motorists dislike the proposal on the ground that the present price of 78 cents per U. S. gallon of gasoline would again be raised . . . And after seven years, they have gotten used to engine knocks.

ALBANIA: Large amounts of oil field equipment has been received from the USSR during the past two months, including lubricants . . . Domestic refineries have no facilities by which required lubricants can be processed.

ROUMANIA: During the third quarter of 1952, the Statistical Office announced that production of crude had increased 28.1 percent above that for the identical period of 1951. But again no standard was cited, and the announcement is meaningless—even to Roumanians themselves,and probably to the Russians, too . . . The newly-founded Carbochim factory in Cluy city, which was opened for operation during September, is scheduled to produce silicon carbide, electrodes and burnishing stones for the oil industry. And great emphasis is being paid the fact that all machinery in the new factory was produced in the country.

A typical Roumanian pledge—at the Nineteenth Soviet Communist Party meeting, workers of the Concordia factory of Ploesti pledged to increase the yield of oil field machinery by three percent, labor productivity by four percent, production costs by five percent, to train 150 new workers, and to effect economies totaling $10,820. No outcome of the pledge has been reported yet.

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Pacific Petroleums Ltd. Continuing Hunt for Gas

Pacific Petroleums Ltd., major backer of Westcoast Transmission Company, is spending $10 million a year in the search for natural gas in the Fort St. John area of northeast British Columbia, according to George McMahon, president of Pacific Petroleums.

Addressing a recent meeting in Calgary of the Canadian Institute of Mining and Metallurgy, McMahon said discoveries in the Fort St. John area "are considered the most significant development of the oil and natural gas industry in western Canada."

He said Fort St. John is the first real multiple-zoned field discovered in Canada, declaring that gas has been found in eight separate pay zones in formations of four geological ages.

In four zones, he said, significant oil showings were found and now are being evaluated, while in all zones the natural gas found was saturated with condensate, or natural gasoline.

British Columbia gas reserves were estimated at 1750 billion cubic feet.

New Company Will Drill Two Wells In Sicily at Cost of $3 Million

It has been announced that Gulf Oil Corporation and MacMillan Petroleum of California will create a joint company—Mediterranean Oil Company—which will begin drilling two wells for a total cost of $3 million in Sicily. This announcement followed completion of a geological survey and research work.

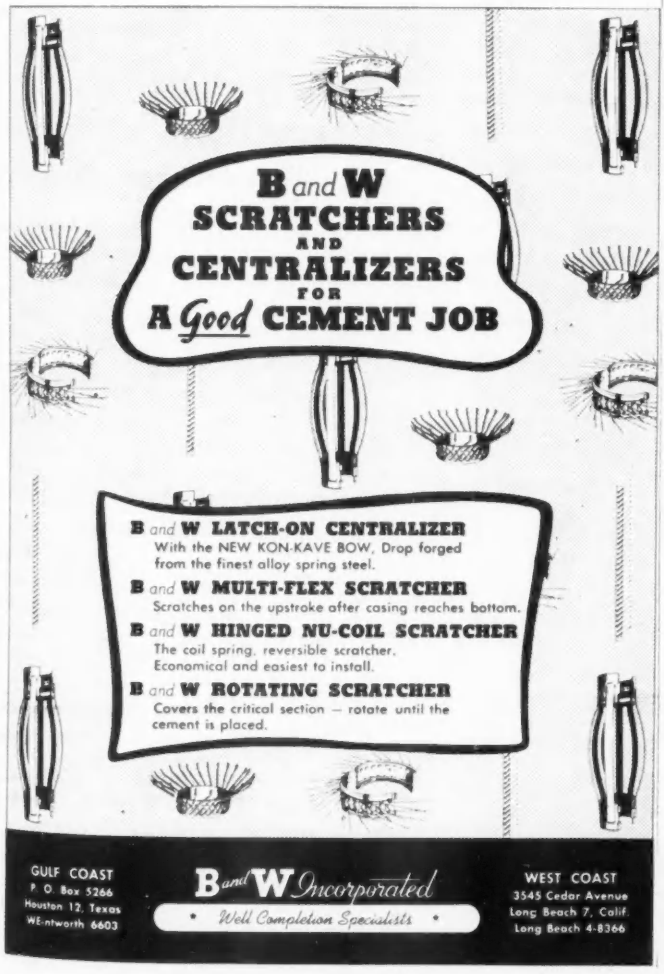
Test drilling has begun in the territories of Raguss, Agrigento, Caltanisetta, and Licata. It is believed that if oil is found it will be at a maximum depth of 9800 feet; however, the drilling equipment is capable of going to 13,000 feet.

Anglo-Iranian Oil Company, which is engaged in exploration activity in Central Sicily and in the zone around Catania, has carried out only geological research thus far.

Meanwhile, Azienda Generale Italiana Petroli, Ente Nazionale Metano and Societa Generale per l'Industria Chimica "Montecatini" are drilling in the zone between Ascoli Piceno and Macerata, where about a half dozen wells have been placed in operation. The area's output has currently reached 17 Mmcf a day. Research work is scheduled to be extended farther south in an effort to supply Rome with natural gas from this area through the construction of a gas line connecting the Adriatic side of Central Italy with the Italian capital.

To insure exploitation of Cortemaggiore gas, Societa Nazionale Metanodotti has signed with Genoese industrialists an agreement viewing the construction of the Cortemaggiore-Tortona-Genoa gas line, which will be placed in operation next year. The line will ensure a daily supply of approximately 105 Mmcf of gas to the Genoese steel works and chemical factories.

Genoese industries have agreed to convert their plants from coal and oil burning to gas burning equipment, and have advanced 50 percent of the cost of construction of same which will be reimbursed through the supply of gas by the Ente Nazionale del Metano.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Manning Encouraging To Future Gas Exporters

Premier E. C. Manning of Alberta has indicated his government will support export of natural gas from southern Alberta fields as soon as reserves in excess of the province's requirements have been proven to exist.

Alberta, Manning said, "has reached a point where it is important to encourage the export of natural gas surplus to its present and future needs."

Leader of the Alberta Social Credit party, Manning said that "because of lack of export," a rich area at Pincher Creek, in southern Alberta, has had to be closed in.

Once Alberta's natural gas requirements are taken care of, he declared, surplus gas should be supplied to the remainder of Canada as far as economically feasible, and then to the United States.

The Alberta Petroleum and Natural Gas Conservation Board is scheduled to resume hearings early in April on five applications for permits to export gas to the U. S. and Eastern Canada.

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- ☐ Conservation & Proration
- ☐ Western Canada Petroleum Association
- ☐ Structure of Federal & Provincial Govts.
- ☐ Business Operations in Canada
- ☐ Minimum Wages & Holidays with Pay
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- ☐ Royalty Payments to the Crown
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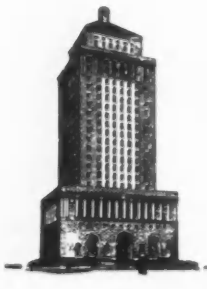

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Iran Agrees to Sell Oil for Military Supplies

During the past two months, Count Ettore Dalla Zonca, chief of Ente Petroli Italia-Medio Oriente, has acted as intermediary between the Iranian, Mexican, Venezuelan and Brazilian state oil interests with the view of creating a federation of state-controlled oil industries to fight privately-owned industry.

Basis of the fight, says a propaganda booklet printed by EPIM is that private concerns foster uneasiness in international political and economic relations and exploit public wealth to the advantage of a few.

Azienda Generale Italiana Petroli denies having any connection with this movement, but Makki, Iranian oil leader, conferred at length during his recent visit at Rome with Vice President of AGIP Mattei and with Fiat Company of Turin leaders. The latter have agreed to purchase 18.9 million barrels of Iranian crude and refined products annually to be paid against equipment for the Iranian army, navy and railways. Such crude would be processed in the Trieste refineries.

Makki has negotiated with AGIP the chartering of tankers to move crude from Iran to continental Europe.

Two Firms Figure in Major Alberta Land Deal

In one of the biggest land deals in Alberta in the past six years, Calgary and Vancouver interests acquired a third interest in more than a million acres spread throughout Alberta in about 60 separate parcels.

The companies are Merrill Petroleums Ltd., of Calgary and Canadian Collieries (Dunsmuir) Ltd. of Vancouver. President of Merrill Petroleums, recently formed through the merger of four other companies, is N. E. Tanner, former Alberta minister of mines and minerals.

The two-company team acquired from Sunray Oil Corporation lands extending from the Pincher Creek area, about 50 miles north of the Montana border, to the Peace River area of northwest Alberta.

Acreage was acquired at Pincher Creek, Peace River, Brazeau, Buck Lake, Barons, Cadotte, Daysland, Duhamel, Lake McGregor, North Stettler, Smoky Lake, South Stettler, Stony Plain, Sylvan Lake, Leduc and Wetaskiwin.

Broader State Oil, Gas Monopoly Is Proposed

The Po Valley oil and gas research and exploitation state monopoly would be widened to include other Italian areas under a new proposal originated by Enrice Mattei, vice chairman of Azienda Generale Italiana Petroli. The monopoly would be set up to include Sicily and Sardinia, as well as the oil and petroleum refining industry and trade.

Such a program was described as justified in view of the difficulties experienced by AGIP with its Po Valley venture as the gas output there is insufficient to meet the demand arising from the gas lines under construction. The gas lines now have a daily capacity of 423 Mmcf; available is only 317 Mmcf daily.

To raise the gas yield, research should be extended to other Italian regions, according to the program envisioned by Mattei. And to pay for this research, a tax on the sale of petroleum products is considered. Since private companies would object to the addition of further burdens on oil companies, the Italian Government should monopolize petroleum processing and trade, says Mattei.

This proposal will be submitted to the Italian Parliament immediately after the 1953 political elections.

Soviets Are Smoothing Austrian Relationships

The Soviet Mineral Oil Administration is paying standard Austrian rates for use of private agricultural land for drilling. Rates, set by the Austrian Chamber of Agriculture, are valid for both Austrians and Soviets, who obey them voluntarily. The charges are being paid promptly.

For one acre of arable land, the fee ranges from 51 cents to $46.25 annually, according to the farmers' products, size of acreage used and damage to land. A fee 10 percent below this standard rate is paid when long-term leases are signed.

The Soviets by this voluntary action have overcome farmers' objections, heretofore a major stumbling block.

In addition, the SOA has agreed to permit Austrian officials from the Government Mining Authority to check the Soviet oil installations to insure conformity with Austrian security laws.

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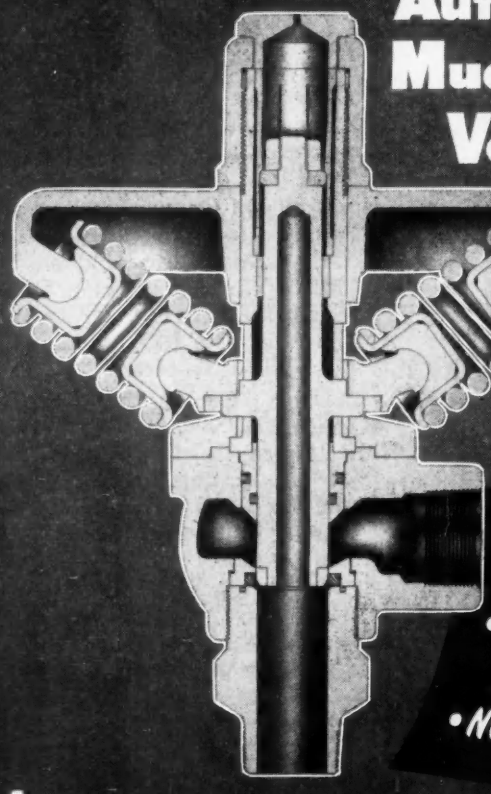

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Alberta's Third Sale Of Year Nets $6 Million

The Alberta government's third sale this year of petroleum and natural gas lease rights saw oil companies pour $6,041,598 into the government treasury for rights on both proven and unproven acreage.

The sale brought to $21,975,166 the amount which the government has received this year from the sale of oil lease rights.

Shell Oil Company paid the highest price for a single parcel offered in the latest oil lease auction, bidding $712,640 for a half-section in the Big Valley area of central Alberta. Shell also paid $552,640 for an adjoining Big Valley half-section.

Calvan Consolidated Oil and Gas Ltd. paid $402,830 for a quarter-section north of Pigeon Lake, about 30 miles south-southwest of Edmonton. For a half-section 60 miles southeast of Edmonton, Texaco Exploration Company paid $426,000.

Other top prices: Shell Oil Company, $403,200 for a parcel in the Malmo district; Texaco Exploration, $327,000 for a Camrose-sector parcel, and Mill City Petroleums, $241,011 in the Leduc sector.

No new records were established, the highest price yet offered for a single parcel in Alberta being $3,110,000 which Texaco Exploration paid earlier this year for a quarter-section in the productive Bonnie Glen district.

Alberta's Crude Yield Rises 8.5 Million Barrels

The Alberta Petroleum and Natural Gas Conservation Board reported that crude production in the first nine months of 1952 amounted to 42,029,450 barrels, an increase in Alberta of 8,502,037 barrels from the corresponding period of 1951.

The board said production in September amounted to 5,739,546 barrels, compared with 4,732,770 in the same month the previous year. At the end of September, Alberta had 3421 operating oil wells, an increase of 848 during the year.

Natural gas production for the nine-month period in Alberta was 67,456,119,000 cubic feet, against 60,802,862,000 cubic feet to the end of September, 1951.

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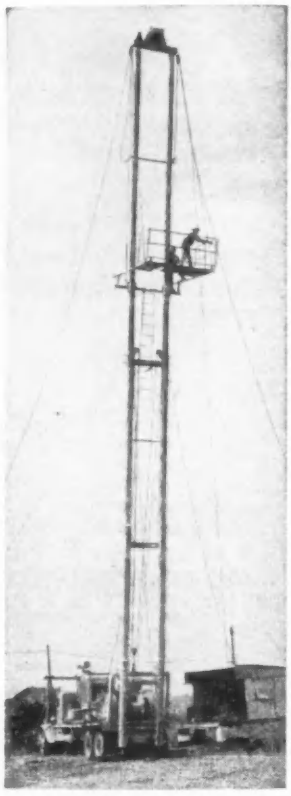

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USSR Claims Oil Yield Of 341 Million Barrels

At the close of 1952, a politburo-member named Malenkov claimed that USSR crude output for the year would reach 341,502,000 barrels, about 65 million barrels more than the production figure claimed for 1950.

To keep pace with industrialization and mechanization of the Soviet economy, the USSR announced earlier that it must produce 435,960,000 barrels of oil annually by 1960. However, this figure has been reset to 508,620,000 barrels, 72,660,000 barrels more than the "Stalin" goal. This increased rate is scheduled for 1955 while the "Stalin" goal had been set for 1960.

The 1951 Soviet production was said to be 1200 percent more than the 1929 yield. With such percentages, the Soviet Union claims economic victories. In most cases, actual data are avoided.

This is the first figure-supported claim released since November, 1951.

West German Oil Yield Sets Daily Average High

In September, West German oil fields yielded a daily average production of more than 35,335 barrels for the first time. According to first reports, a total of 1,069,498 barrels of crude was produced in September, i.e., 14,134 barrels less than in the preceding month which was one day longer.

Hohne field in the Hanover area yielded 61,108 barrels, an increase of more than 4000 barrels from the preceding month. The output of Scheerhorn (Emsland) rose by about 2473 barrels as compared with August. Eldingen, Ruehlermoor and Ruehlertwist also stepped up production.

Nomads Will Register 1953 Exposition Visitors

Nomads organization again will invite and register visitors from the oil producing countries of the world at the 1953 International Petroleum Exposition, May 14-23, at Tulsa.

Nomads Exposition committee will be headed by Harry E. Estes of A-1 Bit and Tool Company of Houston, executive secretary of Nomads national board of regents. Board members from New York, Dallas, Los Angeles and Tulsa chapters will assist him and the Houston chapter subcommittees to handle various phases of the Nomads participation will be appointed.

United States Department of State will issue invitations to the various countries through diplomatic channels. At the last exposition, held in 1948, attendance showed visitors outside the United States, registered from the following countries: Africa, Algeria, Arabia, Argentina, Belgium, Bolivia, Brazil, Canada, Canal Zone, Chile, China, Colombia, Cuba, Dutch East Indies, Egypt, England, Ecuador, France, French Morocco, Germany, Guam, Holland, India, Iran, Iraq, Italy, Java, Lebanon, Mexico, Netherlands, Palestine, Paraguay, Peru, Philippines, Persian Gulf, Roumania, Scotland, Switzerland, Trinidad, Turkey, Uruguay and Venezuela.

The office for the 1953 show was opened April 1. At the 1948 exposition there were more than 1000 individual exhibitor companies and representatives from every oil producing state of the U. S., as well as the 43 foreign countries.

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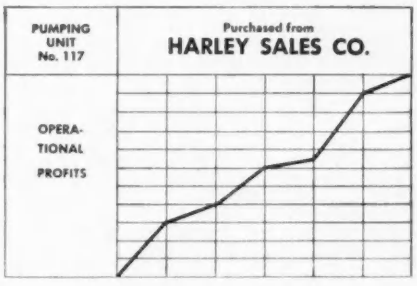

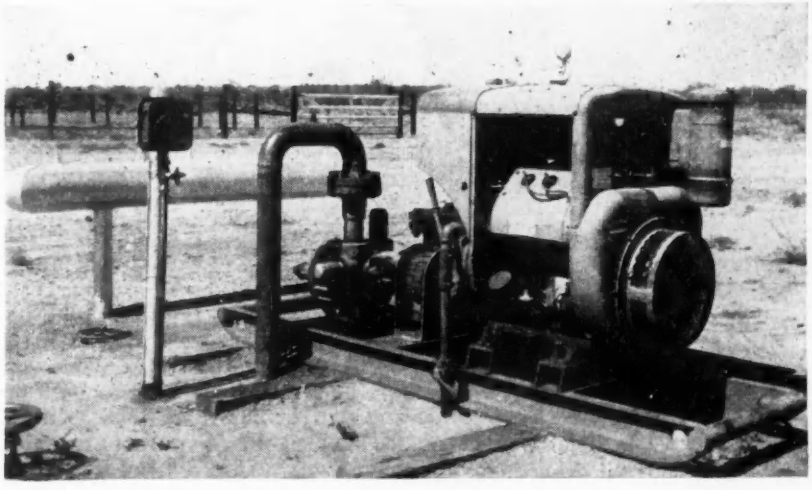

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Genoa Gains Stature as Transit Center

Importance of the Italian port of Genoa is increasing through its selection by Condor, Societa per l'Industria Petrolifera e Chimica, Milan (Rho), as transit center for crude destined for the company's new refinery at Pantano di Rho, which is scheduled for completion in the first half of 1953. Genoa will also serve as transit center for Condor's exportable refined products.

To facilitate its operations, Condor has begun building:

- An oil dock west of the port and connected to a large pump station under erection at Genoa Fegino.
- A main pumping station.
- A pipe line, about 80 miles in length, connecting Genoa Fegino and Pantano di Rho refinery.

The dock is situated at the head of the Molo Ronco, which closes Genoa harbor facilities to the west, and provides accommodations for from four to five tankers. Water at the dock is approximately 50 feet deep.

From the dock two 15-inch steel pipe lines will move crude to the Fegino pump station situated 2.79 miles north from the seaside. A pump station is under construction through which tankers will be able to unload at the rate of 7734 barrels hourly.

In the Fegino station five steel tanks are scheduled to be erected, all with floating roofs, for a total storage capacity of just less than a half million barrels. To build this station, approximately 325,000 cubic yards of rock were excavated. The principal pump station of the pipe line to Rho consists of three centrifugal pumps having a daily capacity of about 27,000 barrels. One of the pumps serves as a standby since two are sufficient to pump more than 11.5 million barrels of crude annually. To transfer crude from tank to tank, three pumps have been installed with a capacity of slightly less than 53,000 barrels an hour.

The pipe line from Genoa to Milan (Rho) consists of 12-inch pipe, covered with a double coating of glass wool and asbestos sheet immersed in bituminous varnish for protection against ground corrosion. The pipe is sunk to a depth of approximately 4¼ feet.

To prevent electrolytic corrosion, an adequate system of cathodic protection has been arranged with stations from 4.9 miles to 6.2 miles apart.

In the first 22 miles, the pipe line reaches the Appenine mountain chain at the maximum heighth of 2559 feet above sea level at Boechetta pass, then follows the Scriva river valley to Seravalle. In the following 55 miles, the line crosses plains, winding its way through Novi Ligure, Tortona, Sannazzaro de' Burgondi, Gropello Cairoli, Casorate Primo, Gaggiano, Settimo Milanese, reaching the Condor refinery at Rho.

Along its route, the pipe line crosses the Scriva, Terdoppio, Agogna, Po and Ticino rivers. To cross the Po, a road bridge was used. To cross the Ticino river at Bereguardo, a special metallic bridge with double arc and chain suspension was selected.

The oil dock which Condor is constructing at Genoa will also be used for the unloading of tankers with crude destined for Permolio Company refineries in Milan and Genoa, which is to be discharged directly into the Permolio pump station at Genoa Fegino.

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News of Men in the Industry

R. F. Baker, vice president in charge of domestic production for The Texas Company, has been elected executive vice president of the firm. Baker is located in New York and will continue there. He joined Texaco in 1916 and became a vice president in 1949. He became a company director in 1950.

•

John A. Fuller, president of Shawinigan Water and Power Company of Quebec, has been elected to the board of directors of British-American Oil Company, Ltd.

•

G. R. Bryant, vice president of The Texas Company, is now Texas chairman of the OIIC with jurisdiction over 331 community committees grouped in 15 geographic areas. Bryant came up through the refining segment of the industry and is a graduate of the University of Missouri and Colorado School of Mines. He joined Texaco in 1937.

G. R. Bryant

•

Oran Graybeal, chief engineer, California division, has been named superintendent of Exploitation for the California district by Sunray Oil Corporation. A graduate of California Institute of Technology, Graybeal has been employed by Sunray and Barnsdall Oil Company since 1938. His reservoir studies of Sunray's Newhall-Potrero Field have been widely studied, and his technical studies of that field appeared in national oil journals and API publications.

•

Hal Acres who joined Sunray Oil Corporation in 1949 as production engineer, has been named chief engineer of Exploitation, California district. Acres served in the engineering departments of Richfield Oil Corporation for 22 years prior to joining Sunray. He is currently chairman of the Pacific Coast district of API.

•

D. G. Haden has resigned as assistant landman for Phillips Petroleum Company at Midland, Texas, and is now geologist in West Texas for the Limpia Royalties Company.

•

William D. Trumbly has been transferred from Midland, Texas, to Oklahoma City and is now on the geological staff of the Republic Natural Gas Company.

•

Fred S. Watson, Jr., formerly a geologist with Watson and Watson, an Okmulgee, Okla., organization, has joined Gulf Oil Corporation's geological department at Casper, Wyo.

•

C. E. Lee, general production superintendent in Shell Oil Company's Houston area, recently observed his 35th year of service and was awarded the traditional diamond tie clasp by Shell. A veteran of Gulf Coast oil development, Lee worked on the first well Shell drilled in that area in 1924, Calcasieu Parish, La. Lee has resided in Houston since 1929.

E. H. Tollefson, vice president in charge of operations, was elected executive vice president of Hope Natural Gas Company. Initially employed by Shell Petroleum Corporation in Arkansas and Texas, he has served Manufacturer's Light and Heat Company as chief geologist, and in 1930 entered the service of the predecessor companies of the New York State Natural Gas Corporation. His service with Hope Natural Gas began in 1939 as manager of the Land and Geological department.

E. H. Tollefson

•

Dee A. Sikes, Helmerich and Payne, Inc., was elected president of the Tulsa chapter of the AAODC for 1953. He succeeds Frank E. Frawley. **F. M. Stevenson**, Signal Drilling Company, and **W. J. Weaver**, Loffland Brothers Company, were elected vice president and secretary-treasurer respectively.

•

Frederic A. Bush, chief geologist for Sinclair Oil & Gas Company, was elected vice president in charge of the geological department. He will continue his headquarters in New York City.

•

J. A. Battle, Jr., was promoted to assistant chief petroleum engineer of The Texas Company's Producing department January 1. Battle, division petroleum engineer of Texaco's Louisiana division, will move to Houston. He joined Texaco shortly after graduating from the University of Texas in petroleum engineering in 1938. Beginning as roustabout at Houma, La., he progressed to petroleum engineer in 1941, and has been division petroleum engineer since 1948.

•

Henry L. Waskowski, Jr., assistant district superintendent of Magnolia Petroleum Company's Oklahoma district, has been transferred to the Falfurrias Producing district as assistant district superintendent.

•

Maggie Chancey, Sunray Oil Corporation's assistant drilling superintendent for California, has been promoted to drilling superintendent. Chancey has served the merged Barnsdall and Sunray organizations since 1924. He will make his headquarters at Newhall Lease offices.

•

Ralph Evans, consulting geologist, has moved from Midland, Texas, to San Antonio where he will specialize in problems relating to West Texas, South Texas and Gulf Coast geology.

•

Earl M. Bagley was appointed division geologist with headquarters at Midland, Texas, for the Bishop Oil Company. Bagley formerly was employed at Bishop's Bakersfield, Calif., facilities.

W. B. Airth, B.Sc., general manager of Ajax Petroleums Limited since the company was formed, was recently elected president. He will continue as general manager of Ajax Petroleums and as president and general manager of Ajax Alberta Pipeline Limited, a wholly-owned subsidiary.

Airth replaces **J. B. Adoue** who resigned the presidency but continues as a director.

Airth directly supervised exploration of Ajax's gas field at Morinville, Alberta, and also construction of the 42-mile gas-gathering and transmission pipeline to Canadian Chemical Company Limited, subsidiary of the Celanese Corporation of America, at East Edmonton. He was a consulting mining engineer before he became associated with the oil and gas industry in Alberta.

•

Robert W. Wire, president of Loffland Brothers Company, Tulsa, has been appointed chairman of the AAODC committee on Research and Education. He succeeds **Jack Abernathy**, Big Chief Drilling Company, Oklahoma City.

•

Mack G. Trusdel, assistant division petroleum engineer, was named Louisiana division petroleum engineer in New Orleans by The Texas Company. Trusdel joined Texaco as a roustabout at New Iberia, La., in 1938 after graduating from the University of Texas in petroleum engineering. By 1944 he was district petroleum engineer, and became assistant division engineer in 1948.

•

Kenneth O. Austin, Wichita Falls, Texas, has been promoted to district engineer of Deep Rock Oil Corporation's Texas district. Austin was in the company's waterflood operations program in Garnett, Kansas, before being transferred to Texas last March. A graduate of the University of Kansas, he joined Deep Rock in May, 1951.

•

David A. Muirhead was named acting assistant chief production engineer of the Arkansas Fuel Oil Company's Production Engineering department recently. Muirhead joined the company in 1949 as a junior engineer and worked on a special pipe line assignment. In 1950 he was assigned as acting district production engineer, AFO Production Engineering department at Olla, La.

•

Billy Gene Nippert who joined Arkansas Fuel Oil Company in 1950 as a roustabout in the Allen, Okla., district, has been promoted to acting district production engineer, AFO Production Engineering department at Olla, La.

•

Morgan J. Davis will inaugurate the 18th lecture series on the Law of Oil and Gas, February 5, when the course convenes at the law school of the YMCA's South Texas College in Houston. Other lectures will be delivered by Spurgeon E. Bell, A. W. Bounds, Nelson Jones, T. J. Lawhon, Herman P. Pressler, James L. Shepherd, Jr., Judge Edgar E. Townes and J. Q. Weatherly.

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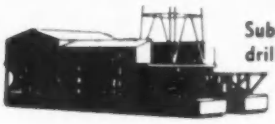

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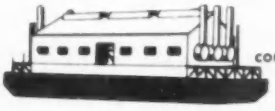

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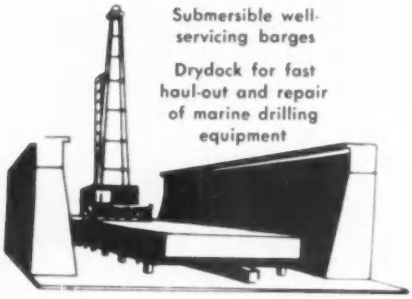

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James L. Parmelee has been appointed manager of Northern Natural Gas Company's new Area Development department. The new department will assist state and local organizations in developing resources in gas producing areas. Parmelee in 1931 did franchise work in the Mid-Western states. He worked out of Amarillo, Texas, for four years on acquisitions of oil and gas leases and gas production problems. In 1950 he returned to Omaha as manager of the Exploration division and has recently been active in company negotiations for a Canadian gas supply.

•

D. L. Harlan, assistant chief petroleum engineer of The Texas Company's Producing department, has been promoted to chief petroleum engineer. He replaces E. P. Hayes in the Houston office. Harlan graduated from the University of Texas in petroleum engineering and joined The Texas Company as rotary rig helper in 1933. In 1938-40 he served as petroleum engineer with the Antilles Petroleum Company, Trinidad, BWI. In 1940 he was transferred back to the U. S. and has been employed in Texas since that time.

•

L. T. Tighe, assistant division manager, has been named division manager of South Texas, Producing department, for The Texas Company. Tighe, with headquarters in Houston, succeeds W. C. Kneale, retired. A Texas A. & M. College graduate in electrical engineering, Tighe was employed by The Texas Company in 1919 as a rotary rig helper.

•

K. L. Beck, Midland, Texas, was recently elected a director of Thompson-Carr, Inc. He will continue as general superintendent in charge of the company's operations. Beck has been associated with Thompson-Carr, Inc., and its predecessor company since 1924.

•

Clyde Allison was named production superintendent of the California district, Exploitation, Sunray Oil Corporation. A veteran of 24 years' service with Barnsdall and Sunray organizations, he moved up from production activities on Sunray's Guijarral Hills properties.

•

John S. Goodrich, formerly at Pegasus, Texas, Producing district for Magnolia Petroleum Company, has been transferred to the Healdton, Okla., Producing district as assistant superintendent.

•

W. J. Sherman retired last month from the South Texas division, producing department of The Texas Company, after 40 years service. Sherman was employed in Houston during his entire office career.

•

John S. Russell, assistant district superintendent of Magnolia Petroleum Company's Falfurrias, Texas, Producing district, has been transferred to Chase, Kansas. He is now located at Kimball, Nebr., where Magnolia recently completed three producers and has two wells drilling at the present time.

•

C. L. Ware is now associated with Makin Drilling Company, Hobbs, N. M., as representative and contact man. His offices are at Midland, Texas.

Darrell Smith has been promoted to assistant division manager of South Texas division, Producing department of The Texas Company, and he will work in Houston. Smith graduated from Texas A. & M. College in petroleum engineering and took his first job with The Texas Company. Beginning in 1939 as a rotary rig helper-roustabout at Hull, Texas, he was successively promted from junior petroleum engineer to petroleum engineer, drilling foreman at Houston, and assistant district superintendent at Freer, Texas. He was named district superintendent at Alice, Texas, in 1950 and advances from that position.

•

William C. Walker has been appointed contract representative for the Permian Basin area of West Texas and New Mexico by Loffland Brothers Company, Tulsa. Walker is a graduate of the University of Kansas in mechanical engineering. Walker served in the Engineering department of Phillips Petroleum Company for two years and in 1949 joined J. P. Gibbins, Inc., Midland, Texas, as an enigneer. He was with Gibbons until his appointment by Loffland Brothers.

•

William H. Green, formerly a junior petroleum engineer for Standolind Oil and Gas Company at Andrews, Texas, has joined Signal Oil & Gas Company at Fort Worth, as petroleum engineer.

•

H. O. Woodberry, geologist at Denver for The California Company, has been transferred to Casper, Wyo., as district exploration superintendent.

•

Orlo Childs, formerly district geologist for Phillips Petroleum Company at Salt Lake City, has been promoted to head a general exploration group with headquarters in Denver. Exploration offices will be maintained at Centralia, Wash., Salt Lake City, Grand Junction, Colo., and probably Thermopolis, Wyo.

•

Bruce F. Grant, formerly with the U. S. Bureau of Mines at Franklin, Penn., has joined Sinclair Research Laboratories, Inc., at Tulsa, as director of the Petroleum Engineering division.

•

Homer Dailey, petroleum engineer for the West Texas-New Mexico division of Continental Oil Company, Midland, Texas, has been promoted to petroleum engineer for the Southwestern region and transferred to Fort Worth.

•

Cletus H. Samples, production foreman at the Pegasus, Texas, district for Magnolia Petroleum Company, has been promoted to assistant superintendent of that district. He will make his headquarters at Midland, Texas.

•

Robert E. Adair of El Dorado, Ark., and Leo D. Recknagel, Shreveport, have organized the Smackover Drilling Company with headquarters at El Dorado.

•

J. Howard Marshall has been elected vice president and named head of the exploration department of Signal Oil & Gas Company succeeding Donald H. Lycon.

E. R. Filley

J. N. Troxell

E. R. Filley, Houston general manager of the Domestic Producing department of The Texas Company, was elected vice president of Domestic Production in December. He will make his headquarters in New York. Filley joined Texaco in 1914 as a member of the Texaco subsidiary, Producers Oil Company. He was transferred to Houston in 1938 as assistant manager of the Producing department. Named manager of the department in 1947, he became general manager in 1949. **J. N. Troxell** was named general manager of The Texas Company's Producing department, succeeding Filley. Troxell has been in the Houston office since 1938. A graduate of Pittsburgh University in petroleum engineering, he started with Texaco in 1922 as an instrument man in Oklahoma. Transferred to Houston as a geologist, he was made department geologist in 1943. In 1947 he was elevated to assistant manager and department geologist.

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Paul L. Kartzke has been appointed a vice president of Shell Oil Company. He will continue to direct Shell's oil and gas activities in Western Canada. Kartzke has been exploration and production manager for Shell in the Calgary area and vice president of Shell Oil Company of Canada, Limited. He joined Shell in 1935 as a junior engineer in California, then was promoted to division manager in the Rocky Mountain area in 1948. Among operations under his direction are the Jumping Pound gas field in Alberta and the gas treatment plant recently erected there for extracting sulfur and processing natural gas for home and industrial use.

Paul L. Kartzke

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L. A. Scholl, Jr., a veteran of 36 years with the domestic and foreign operations of The Texas Company, retired December 31 as geophysical consultant on the general manager's staff, The Texas Company, Producing department. Scholl joined Producers Oil Company, a Texaco subsidiary, as a geologist in 1916. He served in Tulsa and Houston and in 1920 went to Venezuela for five years. Returning to the U. S. in 1926 he did graduate work at the University of California and then returned to New York as a consulting geologist. In 1929 he was made chief of the Geophysical division in Houston. He became manager in 1945 and consultant in 1950.

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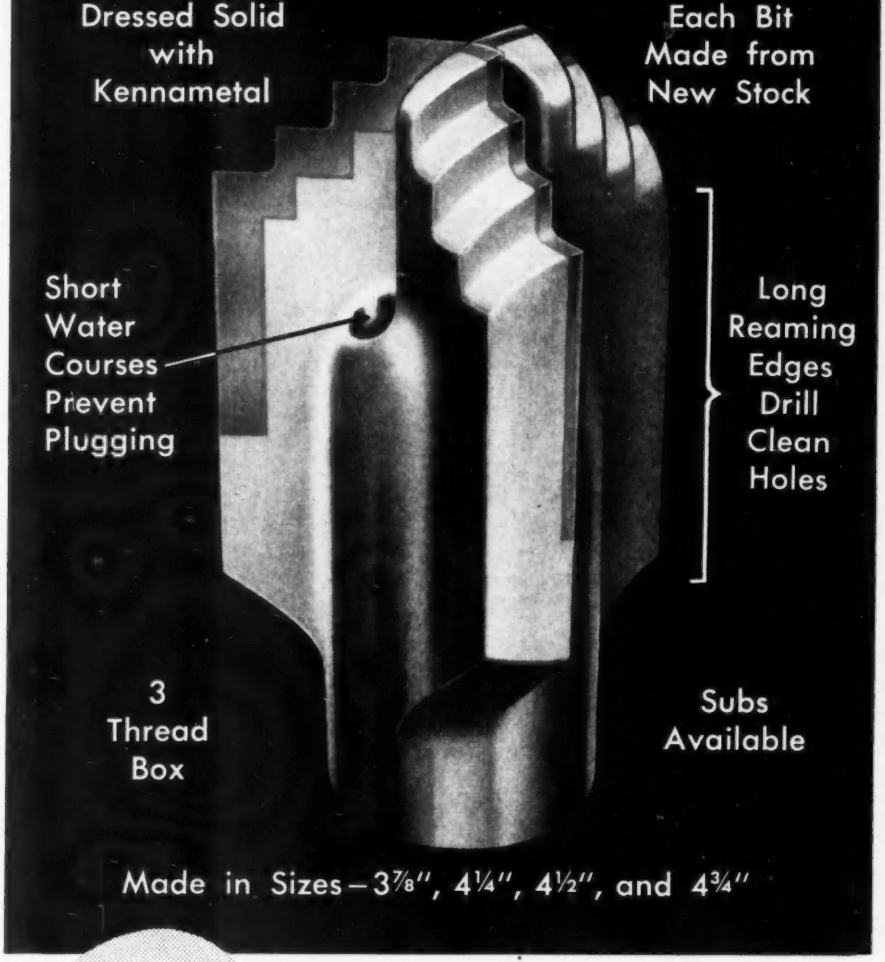
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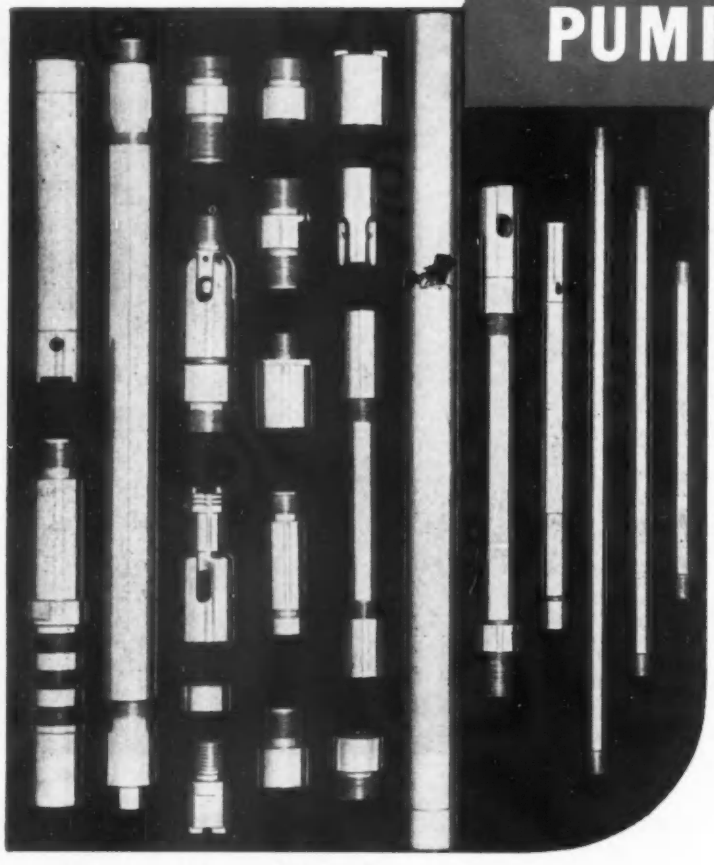

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DEATHS

Albert Buchanan, 62, former vice president of the Independent Petroleum Association of America, died November 30 in Wichita Falls, Texas, while attending the Texas-Oklahoma Hereford Breeders Association where he had bid top price of $45,000 for a bull. Buchanan was a San Antonio oilman, rancher and drilling contractor and operated a number of producing wells in several Texas counties. In 1949 Buchanan received the distinguished service award given by Mid-Continent Oil and Gas Association.

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John Howell, director of Dominion Natural Gas Company, Limited, died November 21 at Buffalo. Prior to his retirement in 1951, Howell had been attorney in charge of the Legal department for Dominion and Republic Light, Heat and Power Company, Inc., of Buffalo. Howell also served Cities Service Company for many years.

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Walter Brown, 66, Tulsa, formerly a part owner of Crest Oil Company, died December 8. He had been with the exploration department of Sinclair Oil & Gas Company for the past 12 years.

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O. U. Bradley, 78, retired oil inspector for the U. S. Indian Service and widely known in the oil industry, died November 15, at Muskogee, Okla.

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C. E. (Charley) Hewitt, 69, Wichita Falls, Texas, oil scout for the Mid-Continent Petroleum Corporation and a former Tulsan, died December 7. He had been with Mid-Continent for more than 34 years.

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Albert Brown Chesebro, 71, retired general manager of The Carter Oil Company, died November 26 in Tulsa. Chesebro who retired in 1931, was a member of a committee appointed to work with the treasury department in applying the first federal law allowing oil companies depreciation and depletion on a unit basis.

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R. P. Gonzales, 59, assistant superintendent of the Gas Pipe Line department of Arkansas Louisiana Gas Company, died November 5 at Pine Bluff, Ark. Gonzales had joined Arkansas Louisiana Gas in 1921, finally becoming assistant superintendent of the Gas Pipe Line department early in 1943.

•

Eugene D. Milener, who joined the American Gas Association in 1928 as a gas research engineer, died November 20 while attending the annual meeting of the Mid-Southeastern Gas Association in Raleigh, N. C. His residence was in New York. A graduate of the Baltimore Polytechnic Institute and the University of Maryland, he joined the Consolidated Gas, Electric Light and Power Company of Baltimore in a sales position after graduation. In 1915 he devised the "degree day" method of calculating gas requirements for heating buildings under various temperature conditions. In early November, he was named coordinator of special activities of the manufactured and natural gas departments of AGA. He also served as liasion executive for AGA and affiliates.

25-YEAR SERVICE WATCHES were presented to three Loffland Bros. Company employes at a California division dinner-meeting recently. Pictured are, left to right: B. B. Smith, vice president; A. H. Holder, general superintendent and honored guest; P. C. Peterson, toolpusher and honored guest; R. W. Wire, president, who presented the watches to the honorees; Phil D. Burbank, toolpusher and honored guest, and J. M. Grant, vice president. Eight other members of the company received watches in 1952 also.

SUNRAY OIL CORPORATION has realigned its Exploration department personnel. **C. F. McCarroll**, formerly Production at Tulsa, was transferred to Exploration as administrative assistant to Vice president H. O. Harder. **E. A. Markley**, Tulsa, is now manager of geological activities. Division geologists are: **J. S. Loofbourow**, Pacific Coast area, Los Angeles; **Bert C. Timm**, Gulf Coast area; **T. A. Clote**, North and West Texas area; **Thom H. Green**, Rocky Mountain area; **Sherril A. Shannon**, Mid Continent area, all of Tulsa.

District geologists are **Lawrence J. Finfrock**, Jackson, Miss.; **William M. Easley**, Corpus Christi, Texas; **R. B. Sullivan, Jr.**, Shreveport; **Clarence Symes, Jr.**, Midland, Texas; **Wilford L. Stapp**, Abilene, Texas; **Glenn W. Sandberg**, Denver; **Eugene C. Eaton**, Casper, Wyo.; **Walter J. Slagle**, Oklahoma City; **E. A. Hutchinson**, Tulsa; **Ralph C. Lamb**, Wichita, Kansas; **Frank Devlin**, Durango, Colo.; **Joe Peerson**, Lake Charles, La.

Senior geophysicists under the new set-up are **T. S. Green** and **Stefan Von Croy**, both of Tulsa. **George A. Schwab**, Tulsa, is new manager of the Land department. Division landmen are **Frank Fueller**, Pacific Coast area, Los Angeles; **Carl H. Zwick**, Gulf Coast area; **George E. Robertson**, Rocky Mountain area; **I. W. Pilkington**, Mid Continent area, all of Tulsa.

District landmen are **W. Carlton Green**, Shreveport, **E. V. Potter**, Corpus Christi, Texas; **Paul G. Potter**, Jackson, Miss.; **Robert W. Mitchell**, Lake Charles, La.; **A. M. Wright**, Oklahoma City; **Frank C. Adams**, Tulsa; **Dewey Gibson**, Abilene, Texas; **C. C. Winchell**, Wichita, Kansas; **Carl E. Davis**, Midland, Texas.

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SOCONY-VACUUM OIL COMPANY announced establishment at Harvard University of a Fellowship in Petroleum Exploration Sciences. The Fellowship will be awarded graduate students in petroleum exploration sciences, preferably majors in petroleum geology.

OIL PRODUCTION RISES
WHEN TUBING TRAVEL STOPS
stop tubing travel with PAGE type B tubing anchor
Recorded experience proves beyond a doubt that well pulling costs are often cut in half while oil production is sharply increased by the use of "Page" hydraulic tubing anchors. High pressure collar leaks are minimized by stopping reverse thrust on tubing threads. Excessive wear on casing, tubing and rods, common with compression anchors, is eliminated. Reversals in the pumping cycle are smoothed out, thereby increasing pump efficiency and reducing sucker rod breakage.
FASTER HANDLING, MORE EFFECTIVE CONTROL
Page type "B" tubing anchors can be assembled in the tubing string either end up. Slips cannot be set during fastest run-in, but set automatically as oil rises in the tubing, thus insuring correct setting depth without the aid of tubing manipulation. Hydraulic principle allows compensation for temperature changes and easy release by draining tubing.
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Association News

Mid Continent Association Reelects Payne President

William T. Payne, president of Big Chief Drilling Company, Oklahoma City, was reelected president of the general Mid Continent Oil & Gas Association at the annual directors' meeting recently held in Tulsa. Clarel B. Mapes was reelected secretary-treasurer, a position he has held since 1933. R. B. Anderson, W. T. Waggoner Estate of Vernon, Texas, was reelected first vice president.

With the exception of Mississippi, all state vice presidents were reelected: T. H. Marshall, retired, Anderson-Prichard Oil Corporation, Oklahoma City; W. G. Tierney, Derby Oil Company, Wichita; R. G. Windfohr, of Nash, Windfohr and Brown, Fort Worth; A. H. Weyland, Arkansas Natural Gas Company, Shreveport; C. H. Murphy, Jr., Murphy Corporation, El Dorado, Ark.; James L. Duffy, James L. Duffy Company, Grove Hill, Ala.; and F. A. Calvert, Jr., Calvert Drilling, Inc., Olney, Ill.

Under the Mississippi system, G. Gardiner Green, independent operator of Laurel, and recently elected president of the Mississippi division of the Association, became vice president for Mississippi, succeeding E. B. McGehee.

Hayes McCoy, recently retired from Cities Service Oil Company and a member of the Association since its inception, was awarded a life membership.

Houston Landmen Elect Roberts To Head 1953 Slate of Officers

H. J. Roberts, Gulf Oil Corporation, has been elected president of the Houston Landmen's Association. Other officers elected at a recent meeting included O. L. James, Fidelity Oil & Royalty Company, vice president; Paul L. Lyons, Warren Petroleum Company, secretary; and Maurice S. Brooks, Jr., Union Producing Company, treasurer.

Four directors were elected. They are Elmer G. Hamilton, Sohio Petroleum Company; Lloyd J. Taylor, Floyd L. Karsten Organization; Clint G. Hall, Jr., Goldston Oil Corporation; and Jack F. Gale, Transcontinental Gas Pipe Line Company.

Deussen and Johnson Awarded Life Membership In AAPG

Two pioneer petroleum geologists have been elected to honorary membership in the American Association of Petroleum Geologists. They are Alexander Deussen, consulting geologist of Houston, and Harry R. Johnson, consulting geologist of Los Angeles. Only 16 other geologists hold honorary membership in the Association. The certificates will be awarded as a high light of the 1953 annual AAPG convention, to be held in Houston, March 23-26.

Alexander Deussen, a "founding father" of the AAPG, served as its second president in 1918-19. In 1947 the Association presented Deussen with the Sidney Powers Memorial Medal. Deussen opened his consulting practice in 1916 and interrupted it only in 1924-30, when he served as vice president of Gulf Coast operations for Marland Oil Company. In 1924 he initiated and directed operations of the first seismograph party to explore the Gulf Coast Plain. He established one of the early micropaleontological laboratories in 1924.

Harry R. Johnson received his early training with the U. S. Geological Survey in the Rocky Mountains and California. He is a graduate in geology of Stanford University. Resigning from the USGS in 1910, Johnson began his career as a consulting geologist, a vocation now in its 43rd year. He has served on national Association committees, and in 1937 was elected president of the Pacific Coast section of AAPG.

HALL OF SCIENCE BUILDING PLANS for the International Petroleum Exposition which will be held in Tulsa next May, are studied by: (left to right Kent Kimball, consulting geologist; B. B. Weatherby, Amerada Petroleum Corporation; William B. Way, exposition general manager; G. H. Westby, Seismograph Service Corporation, and A. L. Solliday, Stanolind Oil & Gas Company.

Fifth Oil Recovery Conference Features Electronic Computers

At the Fifth Oil Recovery Conference sponsored by the Texas Petroleum Research Committee and held at Texas A. & M. College, College Station, December 11-12, more than 250 oil industry engineers heard eleven papers presented on electronic devices that make as much as 20,000 mathematical computations in one second. Used in accounting departments for some time, these so-called "electronic brains" are eliminating the human error and saving untold hours in monotonous computations. Basic principles of the electronic calculator were presented and many new applications to oil industry use were discussed. Applications discussed ranged from calculation of crude oil run tickets by electronics to a methematical analysis of resistivity departure curves. Robert L. Whiting, acting director of TPRC, presented a brief history of the research organization which sponsored the conference.

ASME Asked to Use Care In Releasing New Products

The American Society of Mechanical Engineers were advised to conduct thorough investigation of all new products manufactured by their firms to determine hidden hazards to property and the public. John V. Grimaldi, director of the industrial division of the Association of Casualty and Surety Companies, New York, was principal speaker before the annual ASME convention in New York last month.

"Electronics In Oil Industry" Is Session Scheduled by IRE

The Southwestern Institute of Radio Engineers will feature a technical session on "Electronics in the Petroleum Industry" during its Southwestern IRE Conference and Electronics Show for 1953. The meeting is scheduled at the Plaza Hotel, San Antonio, February 5-7.

Dallas Landmen Organize Group And Announce Slate of Officers

The Dallas Landmen's Association has elected Edwin P. Davis, land supervisor for the British-American Oil Producing Company, president of the recently organized Dallas unit. Other officers elected were J. W. Rawley, Seaboard Oil Company of Delaware; Buford F. Sutherland, Atlantic Refining Co., and Frank Carr, American Liberty Oil Company, vice presidents; E. H. Gunter, independent, with Grady Vaughn, secretary; J. L. Toone, Lone Star Producing Company, treasurer; and Wesley Weed, Sun Oil Company, sergeant-at-arms.

The inter-association committee is headed by Owen F. Stevens of Hanco Oil & Gas Company, Ltd. F. D. Johnson of Hunt Oil Company heads the publicity committee. George W. Chapman, Sun Oil Company, and R. W. Harless, Magnolia Petroleum Company, are co-chairmen of the social committee.

IPE Conducting World-Wide Technical Exhibits Search

The Scientific and Technical Committee of the International Petroleum Exposition is conducting a world-wide search for exhibits, displays, processes, equipment and scientific presentations that will dramatize and demonstrate all phases of the petroleum industry's operations and progress. Progress within the past five years, mass interest and scientific and technical value will be the determining factors in final selection of the exhibits to be placed in the IPE's Hall of Science, a feature of the 1953 International Petroleum Exposition.

Gerald H. Westby, president of Seismograph Service Corporation, is chairman of the general committee which has in turn set up seven special committees. With their respective chairmen, they are: geological, Phil Ingalls, Oil and Gas Journal; geophysical, W. T. Born, Geophysical Research Corporation; development and engineering (co-chairmen) Lloyd Elkins, Stanolind Oil and Gas Company and R. C. Earlougher, Earlougher Engineering; transportation, J. R. Polston, Service Pipe Line Company; refining, W. J. Carthaus, Deep Rock Oil Corporation; petrochemical, Miller W. Conn, Phillips Petroleum Company; technical films, Stanley W. Wilcox, Seismograph Service Corporation.

Each committee will be responsible for selecting exhibits which are outstanding to its particular phase of the petroleum industry and of special interest to the general public. So-called ("moving exhibits"), acting out a process or principle, will be selected wherever possible.

News of Service and Suppliers

American Locomotive Reelects Duncan Fraser Board Chairman

American Locomotive Company recently elected Perry T. Egbert president, and William S. Morris as executive vice president of the company. Duncan W. Fraser was reelected chairman of the board.

Fraser became president of American Locomotive in 1940 and chairman in 1945. In 1950 he became both president and chairman of the company. Egbert has been associated with the company since 1920, working in production, sales and engineering capacities. Named vice president in 1944, he has served as head of the Locomotive and Ordnance division at Auburn and Schenectady, N. Y.

Morris was named vice president-sales in 1944. Prior to that he was vice president of Montreal Locomotive Works, Limited, from 1940-44. He joined the company in 1922.

National Supply Broadens Sales Distribution in Northwest Area

The National Supply Company has broadened its administrative facilities in its Northwest division and formed two new sales districts. A. A. Anderson has been appointed division sales manager at Casper, Wyo., succeeding Robert D. Stottlemyer. Stottlemyer was named assistant division manager.

Walter F. Smith was appointed district manager of the new North Dakota district, formerly served by the Williston and Glendive, Mont., stores. Charles W. Morris was named district manager of the new Wyoming district.

Anderson joined the company in 1924 and has served at Casper, Calgary, Canada, and Denver.

Tieberman Heads New Central Sales Area for Lunkenheimer

A new Central Sales district has been announced by The Lunkenheimer Company, Cincinnati valve manufacturer. Lunkenheimer is currently celebrating its 90th anniversary. The Central district which is headed by Elmer R. Tieberman, will be divided into five territories, with headquarters in Dallas.

Elmer Tieberman

Marshall N. Stickel, working out of Houston, will direct Northeast and Southeast Texas and Southwestern Louisiana. Joseph A. Birkhead will head the Southwestern Texas territory from Houston headquarters. D. R. Davis will have charge of the Oklahoma, Kansas and Western Missouri territory with headquarters in Tulsa. William A. Boles will establish headquarters in Baton Rouge, La., to direct activity in Southeastern and Northern Louisiana, Southern Mississippi and Southwestern Arkansas. Byron P. Roland is representative of the West Texas and New Mexico territory with headquarters at Midland, Texas.

RECTOR WELL EQUIPMENT COMPANY, INC., Hailed last year as one of the best in the company's 20-year history at the annual sales meeting in Fort Worth. L. L. Rector, president, and J. L. Pinkard, sales manager, outlined sales and production plans for the coming year. Attending the meeting were, back row, left to right: C. M. Kestler, Don C. Davis, John L. Curry, George H. Stewart, C. L. Cron, Fred H. Overdorf, George E. Milligan, R. M. White, J. G. Brannon, George S. Badger, E. W. Brockman, B. V. Fisher, R. B. Yanaway and C. W. Zartman. Middle row: Myrl O. Andrews, W. M. Counts, M. C. Davis, W. P. Knight, L. L. Rector, Mrs. Dorothy Johnston, Winifred Roberts and Mrs. J. U. Brown. Bottom row: A. J. LaBate, G. M. Robinson, George Warren, Joe Holt, Robert Kincaid and J. L. Pinkard.

Cooper-Bessemer Establishes Foreign Sales Organizations

Two wholly-owned subsidiary companies were formed recently by The Cooper-Bessemer Corporation of Mount Vernon, Ohio. The new International and Overseas corporations will serve as exclusive export sales distributors for Cooper-Bessemer engines and compressors. Cooper-Bessemer International will handle sales in the Western Hemisphere outside the U. S. Cooper-Bessemer Overseas will be responsible for the remainder of world sales.

Both companies are headed by Michael C. Pollock from headquarters in New York. Offices will be established in Caracas, Venezuela; Sao Paulo, Brazil; and Mexico City.

Whitney Chain Elects Stanton President; Whitney Heads Board

Whitney Chain Company has elected Richard F. V. Stanton, West Hartford, president. W. H. Whitney, president for the past 13 years, continues as chairman of the board. Einar A. Hanson continues as vice president of the Whitney Chain and the Hanson-Whitney divisions. James W. Anderson was reelected vice president of sales and a director.

Directors are Maxwell M. Merritt, West Hartford; Robert E. Carroll, Arrow-Hart & Hegeman Electric Company; Donald S. Sammis, Underwood Corporation; and George W. Warnecke, New York.

Westinghouse Steam Division Advances Veteran Engineers

The Steam Division of Westinghouse Electric Corporation has appointed C. B. Campbell consulting engineer, and named J. R. Carlson manager of engineering. Campbell joined Westinghouse in 1919 as a technical apprentice. Carlson has been with the company since 1926, and was connected with the steam sales department from 1928-1941. Since 1947 he has served as manager of the Steam Division, general engineering section.

Insul-Mastic Appoints Tyler As Southern Regional Manager

Insul-Mastic Corporation of America has named John C. Tyler as Southern regional manager with headquarters in Houston. A native Texan, Tyler once engaged in geophysics and sub-surface geology for The Atlantic Refining Company. In late years he specialized in the sale of industrial paints and asphaltic coatings for the protection of plants located on the Gulf Coast as sales representative for the Industrial Waterproofing Company, the Insul-Mastic licensee in Houston.

Minneapolis-Honeywell Assigns Two Industrial Manager Posts

Minneapolis-Honeywell Regulator Company recently named industrial managers to its Portland, Ore., and Wichita regional officers. Fred B. Akerson heads the Portland installation, succeeding Lester W. Williams. Akerson moved from Boston where he specialized in instrumentation for New England industries.

Wilson R. Coffman is manager at Wichita. He was transferred from Kansas City where he served on the field staff for Brown Instruments Division.

Spencer-Safford Loadcraft, Inc. Appoints Weiss General Manager

Spencer-Safford Loadcraft, Inc., recently announced two new appointments at its Augusta, Kansas, trailer manufacturing plant. Louis E. Weiss was named to fill the new capacity of general manager of the factory. Weiss joined Loadcraft in 1951 as manager of the Aircraft Parts division. In that capacity he set up an Aircraft Parts Assembly Operation which now accounts for over 25 percent of the firm's business.

W. C. Benson who joined Loadcraft in January, 1952, was promoted to chief engineer. He moves up from his capacity as production engineer to replace Durrell Davis, resigned.

American Cyanamid Enlarges Petroleum Chemicals Department

American Cyanamid Company has created several new posts in the Petroleum Chemicals department and consolidated sales for specialty products for the petroleum industry.

R. B. Wainright has been named to the new post of technical director with headquarters in New York. V. R. Farlow, Eastern regional sales manager with headquarters in New York; E. F. Heizer, Western regional sales manager in Chicago; T. O. McDonald, Southern district manager in Houston; Read Larson and Charles O. Brown, Jr., sales representatives in Chicago.

Reed Roller Bit Names Managers For Texas, Louisiana Sales Area

Rudy V. Ellis, formerly Louisiana Gulf Coast division manager for Reed Roller Bit Company, has been transferred to Houston as manager of the Texas Gulf Coast sales division. Ellis has been with Reed since 1929, serving in the Gulf Coast area most of this time.

William J. Green succeeds to the position of manager of the Louisiana territory. Green joined Reed Roller Bit in 1940 and has worked in Texas, Illinois, Indiana, Louisiana and Mississippi. He was promoted from manager of the Mississippi division.

J. F. Forster Erle Breithaupt

Browning-Ferris Company Names Forster Assistant Sales Head

J. Fred Forster, pipe line equipment representative, will head a new department established at the Dallas plant of Browning-Ferris Machinery Company. Forster will supervise representatives in Texas in his capacity as assistant sales manager. Barney D. Williams is general sales manager responsible for plants at Dallas, Greggton and Lubbock, Texas.

Erle Breithaupt will assume Forster's duties as pipe line equipment representative.

Kemper Named General Manager Watson-Stillman Fittings Unit

Jackson Kemper was appointed general manager of the Watson-Stillman Fittings Division of the H. K. Porter Company, Inc. Kemper, promoted from his capacity as sales head of Watson-Stillman Distributor Production Division, will head operating and sales for the division. The company recently completed a $500,000 expansion program.

Hunt Tool Appoints A. F. Peters Manager of Sales Operations

Hunt Tool Company's new sales manager is Allison F. Peters, in sales work for the company for the past five years. He previously was a sales engineer with Texas Iron Works in Houston. Hunt Tool, a Houston firm, has shops in Houston, Bay City and Corpus Christi, Texas, and at Harvey and Jennings, La., as well as representatives in West Texas, New Mexico, Wyoming and Mexico.

Building Huge Steam Turbines

Westinghouse Electric Corporation is constructing two 66,000-kilowatt steam turbines at Sunnyvale, Calif. Each of the 31-foot-long, 207-ton turbines will drive a generator capable of supplying the electrical needs of 165,000 homes. Scheduled for delivery in the 1953-54 season, they are for use by Public Service Company of Oklahoma and the Texas Electric Service Company.

Schlitt Joins Trane Company

Earle H. Schlitt, project engineer for Wolff & Munier, New York City, has joined the air conditioning sales department of The Trane Company, La Crosse, Wis. Schlitt graduated in mechanical engineering from Brooklyn Polytechnic Institute and held engineering posts with Gibbs & Cox, marine architects, and Armo Cooling & Ventilating Company, both of New York.

McKISSICK PRODUCTS CORPORATION
Box 2496 Tulsa, Oklahoma
GET A LOAD OF THIS
. . . FOR SIZE AND POWER
300 TONS!
★ Guaranteed to carry rated loads for the life of the block.
Double-row pre-adjusted Timpken bearings, mounted on 8" diameter shaft.
Johns-Manville "klipper" grease seals. Self-adjusting, positively retains lubricant.
E-Z opening guards for quick stringing up.
McKISSICK BUILDS A BETTER BLOCK FOR EVERY PURPOSE

D. M. Jacks

Dr. W. H. Kirkpatrick

Jacks and Kirkpatrick Named Visco Assistant Vice Presidents

Visco Products Company, Inc., Houston, has appointed D. M. Jacks assistant vice president in charge of sales operations. His headquarters will continue to be in Houston. Jacks attended Mississippi State College and Louisiana State University and has been connected with Visco Products since 1937.

At the same time it was announced Dr. W. H. Kirkpatrick had been named an assistant vice president also. He will operate as technical director and will head the Sugar Land, Texas, plant.

Fred E. Cochran, general field manager since last January, will assist Jacks in the general field operations of sales and service.

Louis Sarosday Is Engineering Vice President of J. B. Beaird

Louis J. Sarosday was recently appointed vice president-engineering of J. B. Beaird Company, Shreveport. Sarosday formerly was with Blaw-Knox Company, Pittsburgh. Since 1937 he was manager of engineering and sales of the Blaw-Knox Steel Forms department and chief engineer of the Construction Equipment and Machinery department.

Louis J. Sarosday

He directed construction and then operated the Blaw-Knox bomb plant at Columbus, Ohio, during World War II. In 1950 he established the company's district office at San Francisco.

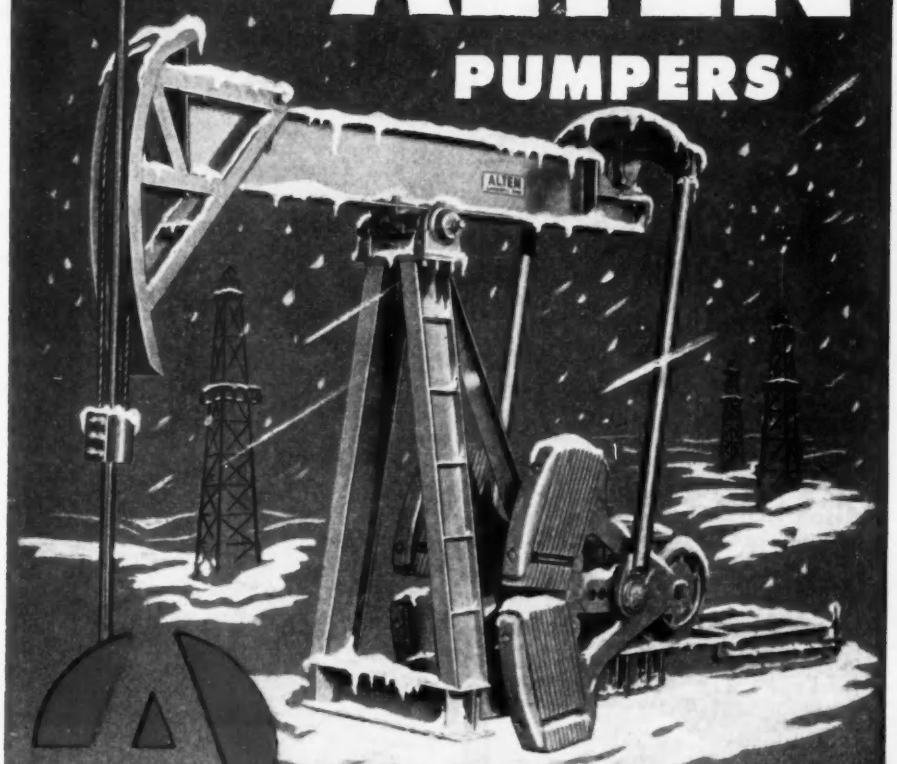
His position with Beaird is a new one. He is a graduate of the Royal Institute of Technology of Budapest, a professional engineer in Pennsylvania, and a member of the National Society of Professional Engineers and the Engineers' Society of Western Pennsylvania.

J. Q. A. Doolittle Is Promoted By Allegheny Ludlum Steel

J. Q. A. Doolittle, manager of the Watervliet, N. Y., plant, has been promoted to assistant to the manager of production for Allegheny Ludlum Steel Corporation. Doolittle will move from Albany, N. Y., to Pittsburgh. Doolittle joined Allegheny Ludlum in 1935 as a student trainee.

Arthur H. Hanks is promoted from manager of the new hot extrusion and stainless tubing department to manager of the Watervliet plant.

No WINTER WORRIES with ALTEN PUMPERS



When you count the reasons why these units pump more fluid at lower cost, add this fact: Alten Pumpers continually perform at full rated capacity through harshest winter weather.

Alten — and Alten alone — has the high level oil system that keeps bearings in oil . . . guarantees complete positive lubrication with the first turn of gears . . . no damage, no operating delay from heavy cold thickened oil. Alten construction is weatherproofed throughout . . . all exposed parts protected from freezing rain, snow and ice. Here is the unit to buy!

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Sales Offices:
Olney, Illinois
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— ALTEN —
Foundry & Machine Works, Inc.
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Branch Warehouses: Wichita Falls & Houston, Texas, Casper, Wyoming, Edmonton, Canada

Mud Products, Inc., Announces Multiple Sales Force Changes

Mud Products, Inc., appointed Roy H. Mitchell as South Oklahoma district manager with headquarters at Ardmore. His territory includes the Duncan and Healdton areas. Mitchell formerly was associated with The Bomud Company at Great Bend, Kansas, and the Ideco Supply Company.

In addition, Chester W. Harper, located at Bomud's Liberal, Kansas, stockpoint, was transferred to Garden City as sales representative in charge.

Ottis A. Ponder recently joined Mud Products as area manager at Duncan. Ponder was once associated with Humble Oil & Refining Company for several years.

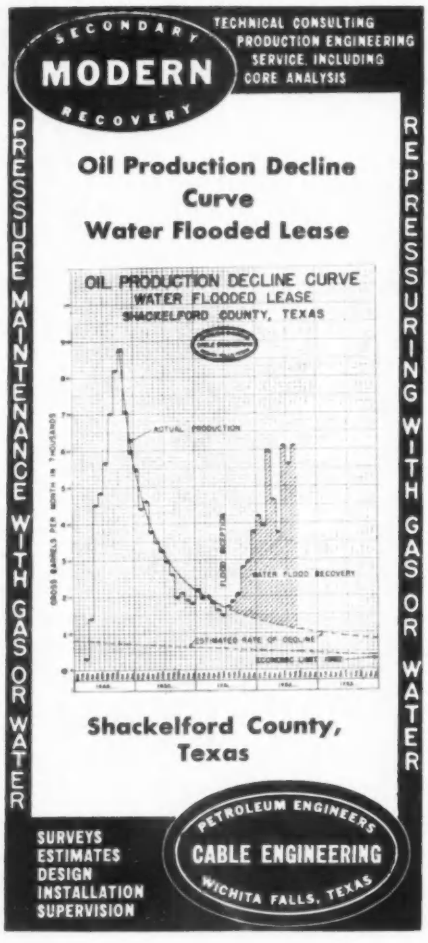
Warren Ashwill, Jr., is now sales representative at Perry, Okla. Ashwill joined Mud Products following a tour of armed service duty in Korea.

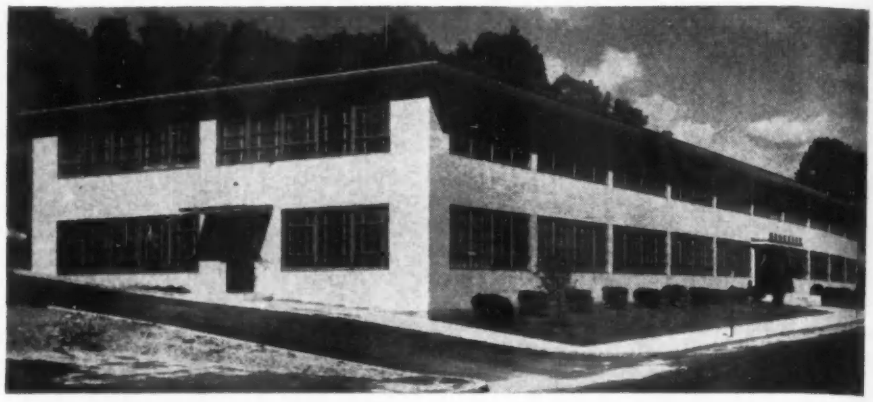
W. Voegeli Named Engineering Assistant for Allis-Chalmers

The newly created position of assistant director of engineering at the Tractor division of Allis-Chalmers Manufacturing Company, Milwaukee, has been assigned to W. L. Voegeli. He will work with A. W. Van Hercke, vice president and director of engineering. Voegeli joined Allis-Chalmers in 1935, becoming agricultural tractor sales manager in 1948.

Pipe Line Technicians Move

Industrial X-Ray Engineers have moved to larger quarters in Tulsa. An affiliate of Industrial X-Ray Engineers, Seattle, the Tulsa office has, since 1948, weld X-rayed over 15,000 miles of pipe line.





LATEST ADDITION TO THE HOMELITE CORPORATION, Port Chester, N. Y., is the newly dedicated Ferguson Building, named in honor of its founder, Charles H. Ferguson. Foundations for this new administration and engineering building were poured in 1951. Completion and dedication of the building in October marked 30 years expansion by Homelite. The photo below is of the factory buildings. The company parking lots are not included in the aerial photo.

Youngstown Sheet and Tube Names Ted Schraer to Conduit Sales Post

Ted C. Schraer, manager of the Cincinnati district sales office of The Youngstown Sheet and Tube Company, has been transferred to general offices in Youngstown, Ohio, as assistant manager of conduit sales. He has been employed by Youngstown Sheet and Tube since 1925, having served as district sales manager since 1938.

Succeeding Schraer at Cincinnatti is C. B. Mullender. Mullender has been with the company since 1934 and has served in the sales field since 1938.

George D. Wick III, formerly in the Youngstown district sales office, has been appointed company representative at Charlotte, N. C. He has been with Youngstown Sheet and Tube since 1947.

Pittsburgh Corning Corporation Opens Kansas City Sales Office

Pittsburgh Corning Corporation has opened a district sales office in Kansas City. Howard G. Jones was appointed district manager of the new Missouri office. Jones formerly was field representative for Pittsburgh Corning in the Southern Illinois, Kansas and Missouri area.

W. T. Clark, H. R. Conant, Jr., J. P. Dillon, R. L. Perkinson and R. B. Shofstall will represent the company in the Kansas City sales area.

Huggins Heads Foreign Trade For Westinghouse Air Brake

William F. Huggins, president of Le Roi International and Le Roi Pan-American, was recently appointed assistant to the president of Westinghouse Air Brake Company at Pittsburgh. Huggins will perform special assignments directly related to Westinghouse Air Brake Company's European companies. Huggins has been with Le Roi since 1945 when he was appointed manager of foreign sales. He will continue his activity as head of the Le Roi foreign trade organizations.

Bond Is Tuboscope Sales Manager

J. V. Bond has been appointed sales manager, Tuboscope Company, for the Louisiana, Arkansas, Mississippi and Alabama territory. His headquarters are in New Iberia, La.

Bond who has been with Tuboscope for three years, was a sales engineer before assuming his new duties.

Cleco Appoints Distributors

Cleco Division of Reed Roller Bit Company, Houston, has appointed Grant and Company, Los Angeles, H. N. Crowder, Jr., Company, Allentown, Penn., and Ponsford Equipment Company, El Paso, Texas, as distributors for Cleco products.

Walter F. Munford

Harvey B. Jordan

Clifford Hood Succeeds Fairless As President United States Steel

Clifford F. Hood

Major changes in top management, effective this month, and operation of new distribution facilities in Houston have been announced by United States Steel Corporation. Clifford F. Hood was elected to the board of directors and president of the Corporation to succeed Benjamin F. Fairless. Fairless will continue as chairman of the board and chief executive officer of the Corporation.

Robert C. Tyson was elected vice chairman of the finance committee and a member of the board of directors and of the finance committee of the Corporation. He continues as comptroller.

Harvey B. Jordan was elected executive vice president-operations of the Corporation. Walter F. Munford was appointed president of the American Steel & Wire Division of U. S. Steel Corporation.

(United States Steel Company was merged with the Corporation January 1, with the Company becoming an operating organization of the Corporation.)

Howard E. Isham was elected vice president and treasurer of the Corporation in December, to succeed Max D. Howell, retired.

New Houston facilities will be under district manager John P. Conner who was transferred to the Supply Division from Tennessee Coal & Iron Division at Fort Worth. The Houston sales area includes a major part of the states of Texas and Louisiana. Conner joined TC&I Division in 1937 at Birmingham, Ala., and he has been connected with the Division continuously since then with the exception of military leave.

American Steel and Wire Division, Cleveland, has named Floyd A. Garman chief engineer. Walter V. Magee is the new assistant chief engineer. Garman joined this Division in 1935 as a draftsman after graduation from Mount Union College and Case Institute of Technology in mechanical engineering. Magee has been with U. S. Steel since 1925, transferring to AS&W in 1927.

The Corporation's new president, Hood, was born on a farm in Illinois. He graduated from the University of Illinois in electrical engineering and was associated with Packard Electric Company in Ohio until 1917 when he joined the U. S. Steel organization as an operating clerk in the AS&W Division at Worcester, Mass. On military leave during World War I, he returned to AS&W as foreman in the electrical cable department at Worcester in 1919. By 1935 successive promotions had made him vice president-operations of AS&W. He was named the Division president in 1938. Named president of Carnegie-Illinois Steel Corporation in 1950, he became executive vice president-operations of United States Steel Company when U. S. Steel took in Carnegie-Illinois.

Pipe Linings Inc. Names Gates Southwestern Representative

A. J. Gates has been appointed Southwestern representative for Pipe Linings, Inc., Los Angeles service organization for the concrete lining of pipe line "in place." Gates will maintain headquarters at Ruidoso, N. M. He formerly was assistant city engineer of Wichita Falls, Texas; superintendent and engineer for Wichita Falls water department; business manager for Midland, Texas, and also connected with Joe E. Ward, Wichita Falls consulting engineer.

A. J. Gates

Vice President Francis Heads National Tank Company Sales

A. W. Francis, Jr., vice president and assistant chief engineer of National Tank Company, has been appointed vice president-sales. Francis is a mechanical engineering graduate of the University of Oklahoma. He served as trainee engineer for Phillips Petroleum Company for three years and was with Smith Separator Corporation at Midland, Texas, until he joined

J. Louis Maher

A. W. Francis, Jr.

National Tank in 1937. He has been on the board of directors of National Tank since 1951. Prior to that he was manager of both the Odessa and Midland, Texas, branches and assistant chief engineer at the Tulsa office.

J. Louis Maher succeeds Francis, Jr., as assistant chief engineer. Maher is a chemical engineering graduate of the University of Oklahoma and was with Phillips Petroleum Company from 1934 to 1940. His experience includes service with Cooper Gas Company as production superintendent.

Given Chicago Sales Post

The Youngstown Sheet and Tube Company has appointed John M. Tuthill assistant general manager of sales, Chicago. Tuthill was manager of flat rolled sales at Youngstown for three years.

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Containing Geological, Engineering, Legal and Accounting words, terms and expressions common to the Petroleum Industry, and 800 abbreviations.—394 pages—$5.00.
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Creole Petroleum Corporation
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■ 8000 acres State & Federal Oil & Gas leases in De Baco Co., New Mexico and 1800 acres in Sherman Co., Kansas. Box 68-W, c/o WORLD OIL, Houston, Texas.

■ TWO 150 horsepower F and T boilers located at Eunice, New Mexico. Makin Drilling Co., Box 131, Hobbs, New Mexico.

■ DRILL PIPE—6000' 4½" good used drill pipe located near Hobbs, New Mexico. Can haul if necessary. Phone Main 0226, Denver, Colorado.

■ For sale to settle an estate 160-acre Hill Country Ranch. Modern Ranch House, Tenant's house, livestock, tractor, implements, barns, mile river front, 1000 Pecan trees, elevation nearly half mile. P. O. Box 1284, San Antonio, Texas.

■ 1—6" A.P.I. Line Pipe Master Plug & Ring Gage. 1—5" A.P.I. Line Pipe Master Plug & Ring Gage. 1—5½" O.D. A.P.I. 8rd thd. Casing Plug & Ring Gage. 1—3½" O.D. A.P.I. 10rd thd. Non-Upset Tubing Plug & Ring Gage. Pipe Coupling Manufacturers, Inc., P. O. Box 488, Martins Ferry, Ohio.

■ 1 Model 1550-C, 2½ x 5 x 10, Gaso Pump. Complete with Mission Valves & Pistons. Ready for use. Will sell for $1,750.00 (½ of new price). 1 International 450 Red Diamond Engine, complete with Radiator, Clutch & Transmission. Total time on engine 5 hours. Will sell at sacrifice. Delivered price $1,000.00. Write or phone 2170, Producers Chemical Service, 1404 S. Cedar, Borger, Texas.

■ For Sale: 8,021 feet of 1¼", 6, 1, 19, Seale Improved Plow Steel I.W.R.C. Preformed Rotary Line, 2,500 feet on one reel and 5,521 feet on a second reel. Rope originally on one wooden reel for shipment by manufacturer to West Coast by water. Reel dropped by stevedore in loading on ship, crushing original reel. Rope recovered and rewound by manufacturer and is in excellent condition. Willing to accept reduced price under market in order to minimize our loss on claim. Communicate Ryan Stevedoring Company, Inc., P. O. Box 1836, Baltimore 3, Maryland.

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■ Longest established Pipe and Supply yard in the heart of the South Texas oil fields—consisting of ten acres of land—office building (with living quarters)—shop (two pipe machines)—warehouse—storage building. Out of the city limits on main highway. If interested write Box 1495, Alice, Texas. Phone 525, 2358 or 264J.

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■ Manufacturers representative for established line of oil field specialties in Canada. Also in North Texas, Panhandle and West Texas-New Mexico area. Advise experience, lines now being handled and territory covered. Box 2632, Tulsa, Oklahoma.

HELP WANTED

■ Assistant Controller—Integrated Oil Company in Mid-Continent area is seeking an experienced Assistant Controller. Position requires top-level man with experience in oil, systems and costs. Please submit resume which must give complete data on experience, salary requirement, and personal history, including education, background and associations. Box 61-W, c/o WORLD OIL, Houston, Texas.

SITUATIONS WANTED

■ Geologist—University of Wisconsin Grad, age 29, single. 1½ years in analytical chemistry, 5 years in publications—desires a position in which these qualifications can be used—Midwest preferred. Write box 66-W, c/o WORLD OIL, Houston, Texas.

■ Petroleum Engineer experienced in drilling, completion, and work-over of wells in the Gulf Coast on land, barge, and off-shore jobs desires to make a change provided you have enough interesting work to keep him busy. Box 67-W, c/o WORLD OIL, Houston, Texas.

Drilling contractor operating in West Texas and New Mexico desires to contact small or medium-sized independent oil company who needs an operating manager. Personal interview desired. Twenty years experience in all phases of the oil industry. Address replies to Box 94-W, WORLD OIL, Houston 1, Texas.

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■ **WE WILL BUY Producing Oil Royalties. Send Particulars. Standard Security Co., 111 Broadway, New York 6, New York.**

WILLISTON BASIN ROYALTIES

Dealers in Montana royalties since 1921, we now specialize in royalties under major company leases in the Montana portion of the Williston Basin. For information on our method of operation, write LANDOWNERS ROYALTIES COMPANY, Box 1225, Great Falls, Montana.

■ Hamilton & Hamilton, Inc. and Associated Companies, Northern Petroleum Company and Petroleum Acreage, Inc., have producing and semi-proven oil and gas leases in Montana, to sell or sub-lease to reliable parties on working agreement basis. Write for information: P. O. Box 1605, Room 535 Ford Bldg., Great Falls, Montana.

SALES REPRESENTATION

Established sales organization operating in Texas, Louisiana and Southern Arkansas is in position to represent an additional manufacturer. Sales personnel includes graduate engineers. Active representation assured by experienced personnel already well acquainted and successfully serving the petroleum industry. Box 63-W, c/o WORLD OIL, Houston 1, Texas.

W. A. Posey

W. J. Nutto

New Posey-Nutto Supply Store Opening Soon in Casper, Wyo.

W. A. Posey and W. J. Nutto have opened the Posey-Nutto Tool Company in Casper, Wyo. The tool company represents several manufacturers of oilfield equipment in the Rocky Mountain area.

Posey's experience includes service as driller, tool pusher, salesman of oilfield equipment, and district manager for Security Engineering Company. Nutto was formerly sales manager for the Hunt Tool Company, Houston.

Foxboro Expands Dallas Plant

Factory facilities for control valve assembly were recently acquired in Dallas by The Foxboro Company, Massachusetts manufacturer of industrial instruments. This is not a new branch but an expansion of a branch in existence for over 20 years.

Atlas Names Representative

Barnes & Delaney, Long Beach, Calif., has been named Atlas distributor by The Atlas Chain and Manufacturing Company. Barnes & Delaney will head up all sales in Southern California for Atlas Roller Chain.

FOR RENT

■ Brick office building, air-conditioned—heat. Fireproof. 2000 sq. feet; plumbing for paleo laboratory. Fluorescent lighting, electric sockets. Geophysics storage rooms, parking space. $350.00 month to responsible tenant, long lease. Staple St. and North Craig St., Corpus Christi, Texas. E. Gross, 4603 Timon, Corpus Christi, Texas.

FOR RENT

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New Books, Maps and Movies

OIL REFINING AND DRILLING IN THE U. S. A. Group edited. The Organization for European Economic Cooperation, Columbia University Press, 2960 Broadway, New York, 27. $5.

This official report concerns Technical Assistance Mission 68. Members of this mission represented Austria, the Netherlands, France, Germany and Italy and were instructed to study U. S. facilities and practices for six weeks with the thought of incorporating applicable features and practices into European oil operations. Because the oil industry is a young industry which has been directly affected by American practices, no startling differences were pointed out by the mission. The written report developed into a general guide for the European producer or refiner rather than a comprehensive technical survey.

VOLUMETRIC AND PHASE BEHAVIOR OF OIL FIELD HYDROCARBON SYSTEMS. M. B. Standing, California Research Corporation. Reinhold Publishing Corporation, 330 W. 42nd Street, New York 36.

This volume represents a practical compilation of widely scattered data on the behavior of hydrocarbon systems in petroleum reservoirs. Discussions have been systematized under three categories: gases, condensate systems and dissolved gas systems.

ROCKY MOUNTAIN PETROLEUM DIRECTORY. 1953 Edition (Ninth Annual) Petroleum Publishers, Inc., P. O. Box 1528, Denver. $1.50.

This handy pocket directory provides alphabetized listings of operators, drilling contractors, geophysical contractors, refineries, natural gasoline and cycle plants, suppliers, consulting geologists, geophysicists and petroleum engineers, brokers, pipe line companies, clubs and associations, federal and state offices, all broken down in alphabetical lists by category.

THE OIL AND GAS DIRECTORY. 1952-53 Edition. Oil and Gas Directory, Inc., 504 Richmond, Houston 6. $22.50.

The new directory covers data concerning Texas, Oklahoma, Louisiana and New Mexico, and has more than 65,000 listings for quick reference. It tells who does what and where and provides the quick way to locate companies or persons to perform specific jobs.

GAS FACTS. 1951 Edition. Bureau of Statistics, American Gas Association, 420 Lexington Avenue, New York 17. $1.

This 1951 edition of gas industry statistics was compiled by the American Gas Association Bureau of Statistics from information gathered from companies representing virtually all operations of the nation's gas utility and pipeline industry. Under basic operating data such as customers, sales and revenues, about 95 percent of the industry is represented.

Data on Hawaii and Puerto Rico have been added to this year's edition. A new table contrasts the number of residential gas utility customers using gas for house-heating, annually since 1949, with the expected number of additional users to be served during each of the next three years.

FIELD GEOLOGY, 5th Edition. Frederic H. Lahee. McGraw-Hill Book Company, New York. $8.50.

A field manual in use for a quarter century, the fifth edition provides a thorough revision which improves and brings up to date existing material, and includes all new developments in such areas as geophysics, well-logging, and air photography. This volume has long been acclaimd by geologists for its broad coverage of subject matter, concise definitions, and consistent policy of explaining the similarities and differences between phenomena which in certain respects resemble one another, but which may be of radically diverse origins.

OIL AND GAS IN PERRY COUNTY, OHIO. Report of Investigations No. 10, Petroleum and Natural Gas Series No. 2, by Robert L. Alkire. Ohio Department of Natural Resources, Orton Hall, The Ohio State University, Columbus 10.

First of a new series dealing directly with oil and gas in Ohio, this booklet contains two large insert maps of the county, and other, smaller maps of individual fields. Fifty-six of Ohio's 88 counties have oil and gas producing histories. Reports on development and potential future outlook in each county will be presented in later bulletins.

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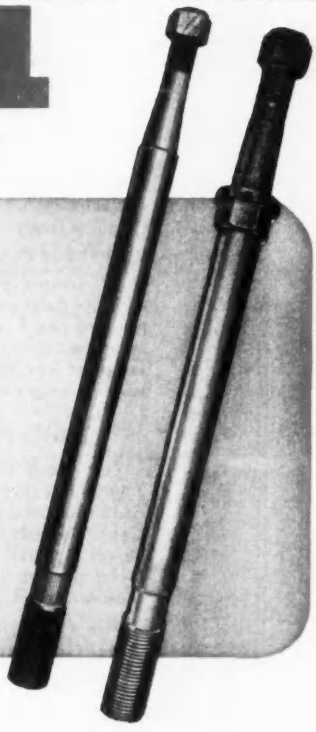

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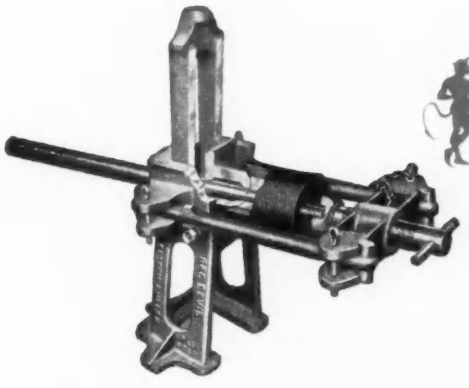

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For tapered type rods

The usual practice of removing pistons from rods by blows of a sledge hammer often damages either pistons or rods. A Red Devil piston puller easily and quickly removes badly stuck pistons without injury to either part. All elements are made of finest quality alloy steel, heat-treated for strength and long life. Write for Catalog No. P-106.

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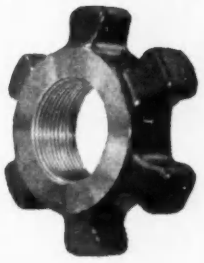
These "Hammer Lug Type" nuts provide a fast and positive means for locking piston rod in crosshead. Made from alloy steel and heat treated, they will last indefinitely. Face of nut is precision machined for full seating surface at right angles to axis of threads to prevent fatigue stresses in rod. Write for Catalog P-102.



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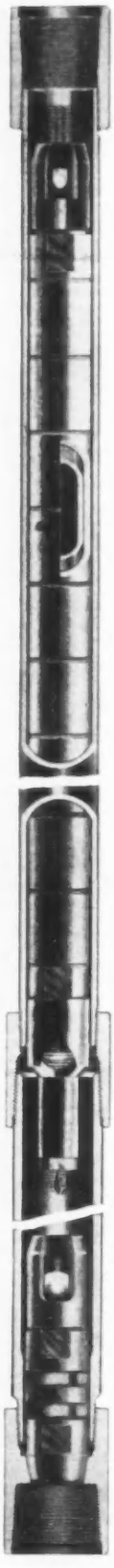

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Low repair costs because most pulling jobs are rod jobs—not tubing jobs. Barrel is designed to wear longer than plunger — permitting plunger to be repaired several times before replacing barrel. Plunger is composite type allowing replacement of worn sections without replacing threaded parts.

Efficiency high because of large fluid openings in plunger and oversize standing valve and because of low friction between plunger and barrel.

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Top and Bottom Collar Type: For average well conditions and wells with gassy fluid. Common barrel simplicity with metal plunger pump performance.

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Increase your profits from your Large Volume Wells . . . Equip them with O'Bannon Arrow Tubing Pumps.

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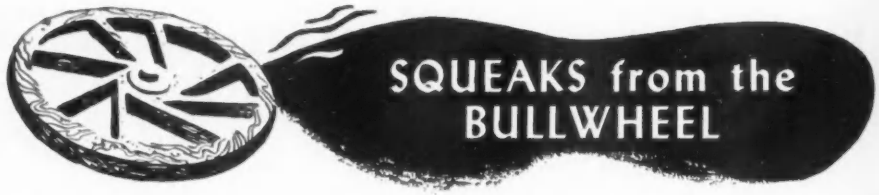

Buzzard Perhaps?

A famous surgeon was asked out to dinner. The hostess felt that he would be the logical person to carve the chicken and asked him to perform the task.

All did not go well for the surgeon and the chicken slipped off the platter unto the hostess' lap. Embarrassed, but attempting to pass the incident off, she mouthed this tactful bit of banter:

"Gracious, doctor, I don't know whether I could trust you to operate on me or not!"

The surgeon pulled himself up to full height. "You, madam," he said, "are no chicken!"

Mathematical Factor

All the animals had left the ark except two snakes lying over in a corner.

"Why don't you go forth and multiply?" they were asked.

"We can't. We're adders."

It's Brew—Not Blow

At a recent shipyard launching, the woman who was to christen the boat was nervous.

Shipyard Manager: "Do you have any questions, lady?"

Woman: "Yes, How hard do I have to hit to knock it into the water?"

"Oh stop complaining. You're saving five bucks aren't you?"

Pop's Left Speechless!

"Why is our language called the mother tongue, dad?"

"You'll learn the answer to that as you grow older, son. It's because father seldom gets a chance to use it!"

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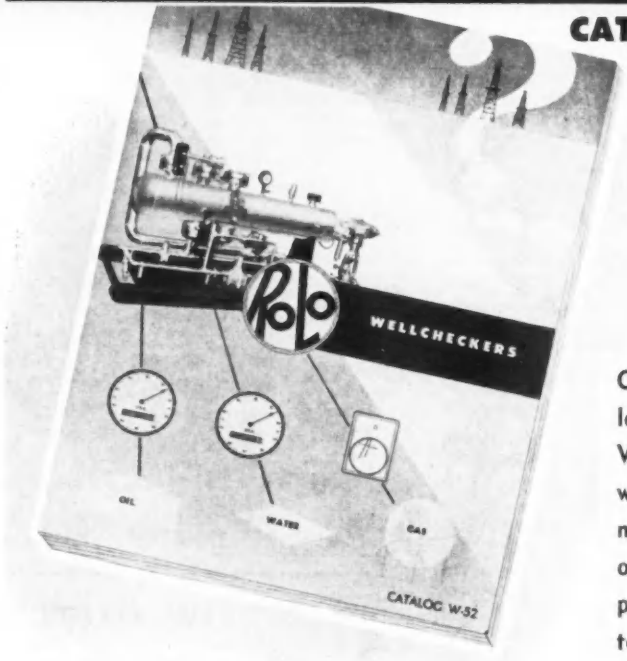

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Here's a completely new booklet prepared for production-minded oil men who are interested in getting more oil after perforating.

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. . . How the simultaneous firing method gets better results

. . . How simple, scientific design provides greater power and deeper penetration

. . . A series of penetration tests covering all sizes of McCullough Burrless Bullet Perforators

McCULLOUGH GLASS JET PERFORATING

. . . Types and sizes of guns

. . . Strip Carrier and Solid Bodied Guns

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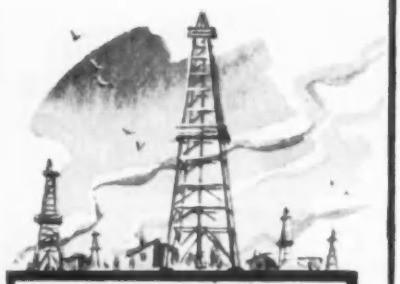

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Unsuccessful Dodge

The Daily Telegraph, London, tells about a newly-married stock broker who received induction orders from the War Office. He replied in a letter explaining his situation and said, "See Luke 14:20." ("I have married a wife and therefore cannot come.")

He received a reply from the War Office telling him to comply with the order and adding, "Your attention is drawn to Luke 7:8." ("For I also am a man set under authority, having under me soldiers, and I say unto one, go, and he goeth, and to another, come, and he cometh.")

Having heard nothing further, we think he wenteth.

•

Patched Watermelon

The teacher of a civics class, who asked her pupils to explain what was meant by "splitting a melon," was agreeably surprised to receive the following written answer from one of her pupils, whose father is a factory worker:

"Splitting a melon is a term used in corporation finance and means dividing up the profits. In the old days when corporations split a melon, part of the money was left with the corporation to increase its plant and production and part went to the stockholders in the form of a dividend.

"Nowadays, when a melon is split, the stockholders get the skin, the Government gets the meat, and the seeds are left with the corporation so that it can raise more melons for the Government later on."

•

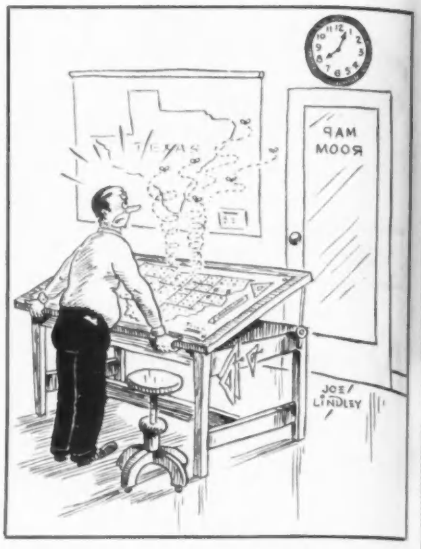
Milquetoast Endurance

"Did you give the prisoner a good going-over?" asked the sheriff.

"We sure did," replied the deputy. "We browbeat him, badgered him, and asked him every question that we could possibly think of."

"And what did he do?"

"He merely dozed off, mumbling: 'Yes, dear, you are perfectly right.'"



"Dawgone flies! Now I'll have to check all these locations again."

Last Maneuver

A convict who was about to be electrocuted phoned his lawyer from the death chamber.

"They're about to put me in the electric chair," he said. "You're my lawyer, what do I do now?"

After thinking a moment, the lawyer replied: "Don't sit down."

•

Second Chance

After ten years on a tropical island, a shipwrecked sailor was overjoyed one morning to see a ship with a boat putting off for shore. Just before the boat was beached the officer in command tossed the sailor a bundle of newspapers.

"Captain's compliments," he said. "Look these over, you lucky devil, and if you still want to be rescued, we'll be back for you tomorrow."

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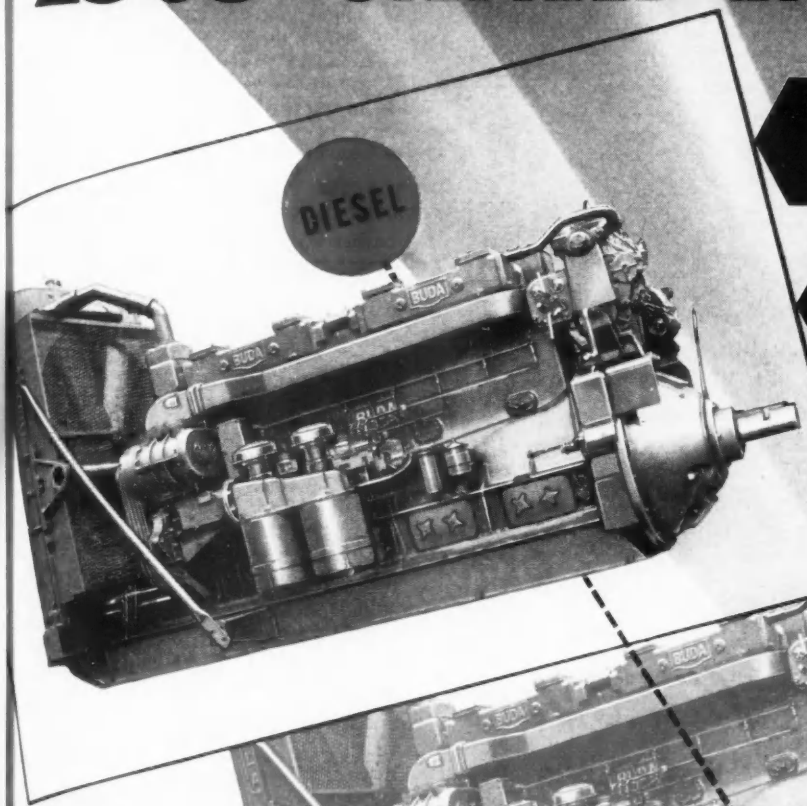

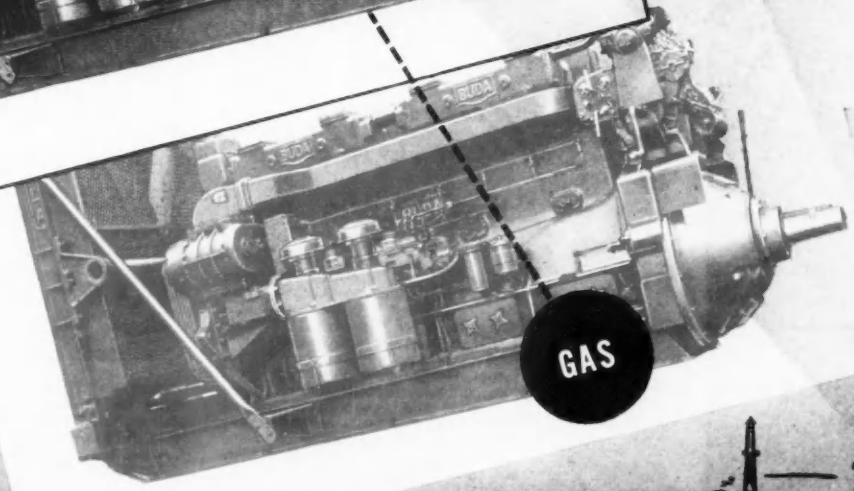

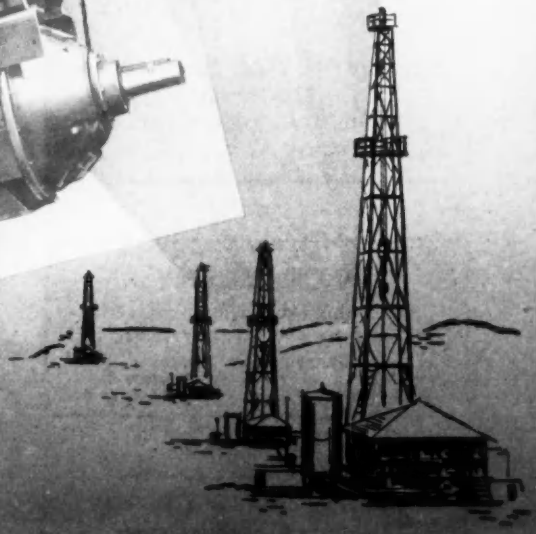

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Scullery-duggery

Two men in a dining-car were ordering breakfast. The first one said to the waiter: "George, you may bring me two fried eggs, some broiled Virginia ham, a pot of coffee and some rolls."

The second man said: "Bring me the same." Then added, "Just eliminate the eggs."

"Yassa."

In a moment the waiter came back. "'Scuse me boss, but just what did you all say about dem aigs?"

"I said eliminate the eggs."

"Yassa." And the waiter scurried back to the scullery. In a moment he came back once more, leaned confidentially and penitently over the table and said:

"We had a bad accident jest afo' we leave de depot dis morning boss, an' de 'liminator done got busted off, right at de handle. Will you take yo aigs fried same as dis hyar gemman?"

End of Honey-Moon

The salesman, well traveled in the South, had bragged of the excellent honey served at one hotel where he and his new bride were to stop. At breakfast he stopped the waiter and asked:

"Rastus, where's my honey?"

"Dunno, boss, dunno. She done quit working here six months ago."

Phoney Phonetics

Mother: "Surely you did something besides eating at the Sunday School picnic?"

Johnnie: "Yes, Mom. Afterwards we sang a hymn called, 'We Can Sing, Full Though We Be.' "

On investigation, the hymn turned out to be, "Weak and Sinful Though We Be."

Long Success Story

The civil service applicant applied for a position in the diplomatic corps.

"What makes you think you are qualified?" he was asked.

"I've been married 20 years," he answered modestly, "and my wife still thinks I have a sick friend."

Reclassification

A barber was surprised to get a tip from a customer getting into his chair.

"Thank you," said the barber, "you are the first man who ever gave me a tip before I gave him service."

"That isn't a tip," snapped the customer, "that's hush money."

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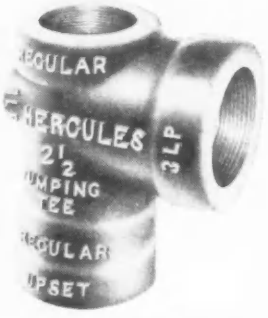

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